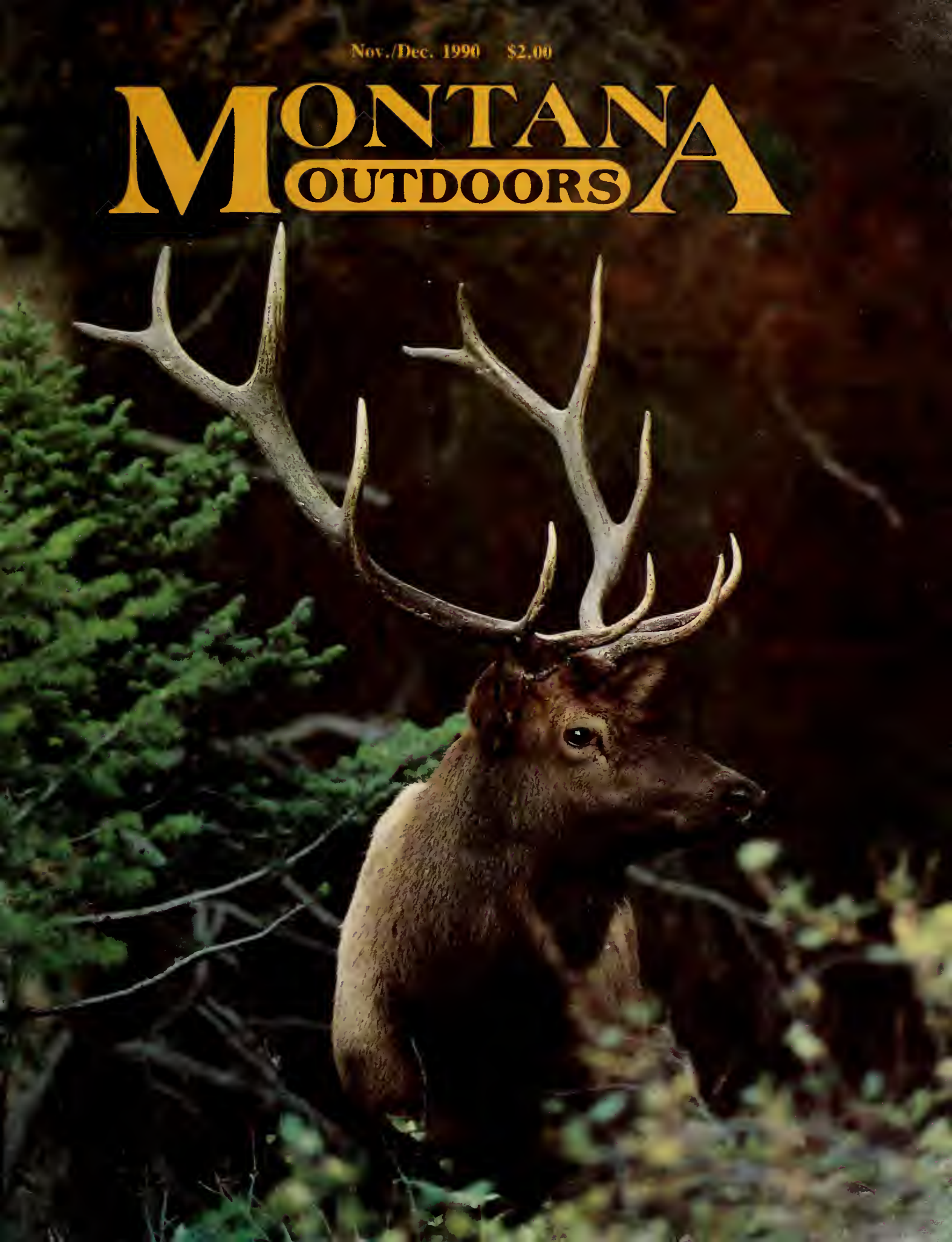
Nov./Dec. 1990 $2.00

MONTANA OUTDOORS



OUR POINT OF VIEW

Twenty years ago, *Montana Outdoors* took a "new look" at conservation with the first issue of this magazine. Featured articles included landowner/sportsman relations, Montana's state parks, the grizzly, states' rights to manage resident fish and wildlife, and a "Director Speaks" column.

Not much has changed, yet everything has changed. The issues of 20 years ago are still our business. They will be with us 20 years from now when another director puts pen to paper and writes "Our Point of View."

Today the complexity of the issues and the rules, regulations, and procedures by which we manage have certainly changed. Removing our state animal, the grizzly, from the federal endangered species list will be a complex and difficult task that will test the right of our state to manage resident wildlife.

These issues are no longer just biological questions. Today they are legal, social, political, and financial questions where procedure is frequently more important than product. Superfund cleanup, mitigation for fish and wildlife losses, water leasing, Tribal rights to manage fish and wildlife, the Endangered Species Act, anti-hunting, law enforcement "sting" operations, knapweed control, Yellowstone bison, wolves, and watchable wildlife are but a few of the new issues that have been added to our agenda. The old issues also remain.

Your department has changed over the past 20 years, just as *Montana Outdoors* has changed. This magazine represents the professionalism and integrity of our employees and this state's commitment to manage our natural resources.

We feel a comfortable part of Montana, and we're proud enough of our accomplishments in protecting and managing our natural resources to openly ask for your support. We hope you will demand the quality of resource management we've demonstrated in the past, and that you will push us to be the best wildlife agency in the country—not in the distant future, but now.

Today we're listening to our customers more than we ever have in the past, and we're looking for your involvement, commitment and direction as we chart our course for the remainder of this decade.

I hope you'll join us at one of our listening meetings or make your views known to our legislators or Governor Stephens so that we can continue to keep Montana "The Last Best Place."

K.L. Cool
Director
Montana Department of Fish, Wildlife & Parks

TIM LUCAS

DONITA SEXTON

Turn to page 8 for an article on Montana's most complete *Tyrannosaurus rex* skeleton.

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Back Cover—The scene is Chaffin Creek Canyon and **Mark Lagerstrom's** back cover photograph displays some of the reasons why some people regard it as the *only* season.

TWO WORLDS of the WHITETAIL

by Gary Dusek

THE WHITE-TAILED DEER IS THE BEST KNOWN, most widely distributed, and most intensively studied big game animal in North America. Its cultural and aesthetic values predate colonization. Whitetails provided food, clothing, and small tools for both native Americans and European settlers. Their hides were once used as a medium of exchange. Today, they remain an integral part of American culture.

In Montana, the whitetail has emerged as a highly popular game animal. The annual harvest has increased over the past four decades from fewer than 10,000 animals in the early 1950s to more than 40,000 in the last half of the 1980s. This has coincided with increases in both numbers and distribution of whitetails throughout much of Montana. The proliferation has resulted, at least in part, from natural changes in plant communities and land uses that have enhanced whitetail habitat. Also, one cannot ignore the whitetail's behavioral adaptability, which allows it to occupy a wide range of habitats.

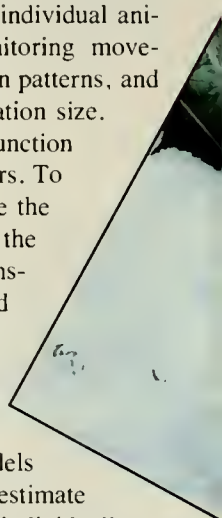
Montana is home to two of the 38 races, or subspecies, of white-tailed deer that occur over the species' range. This range includes boreal forests along the Canadian Shield, deciduous and coniferous forests and deserts across North America, and subtropical and tropical forests of Central America and northern South America. Only minor or subtle differences in body size, antler size, and coloration separate many of the subspecies; in general, body size decreases from the northern to the southern portions of the range.

The Dakota subspecies (*Odocoileus virginianus dacotensis*) occupies much of the northern Great Plains, including the eastern two-thirds of Montana. The Rockies provide a sharp line of demarcation between the range of this subspecies and that of the Northwest whitetail (*O. v. ochrourus*), which is widely distributed throughout the northern Rocky Mountain region.

The two subspecies generally are similar in coloration and antler size, and appear to differ only in body size and weight. Although Remington Kellogg, former director of the National Museum, Smithsonian Institution, reported the Dakota whitetail to be a little larger than its northwest counterpart, dressed carcass weights of 869 whitetails examined at hunter check stations in the Swan Valley of northwestern Montana (1975-83) and 129 from the lower Yellowstone River in eastern Montana (1980-86) showed the Dakota subspecies to be the smaller of the two. Weights of both males and females of all ages from the lower Yellowstone averaged about 90% of those of respective sex and age classes from the Swan Valley.

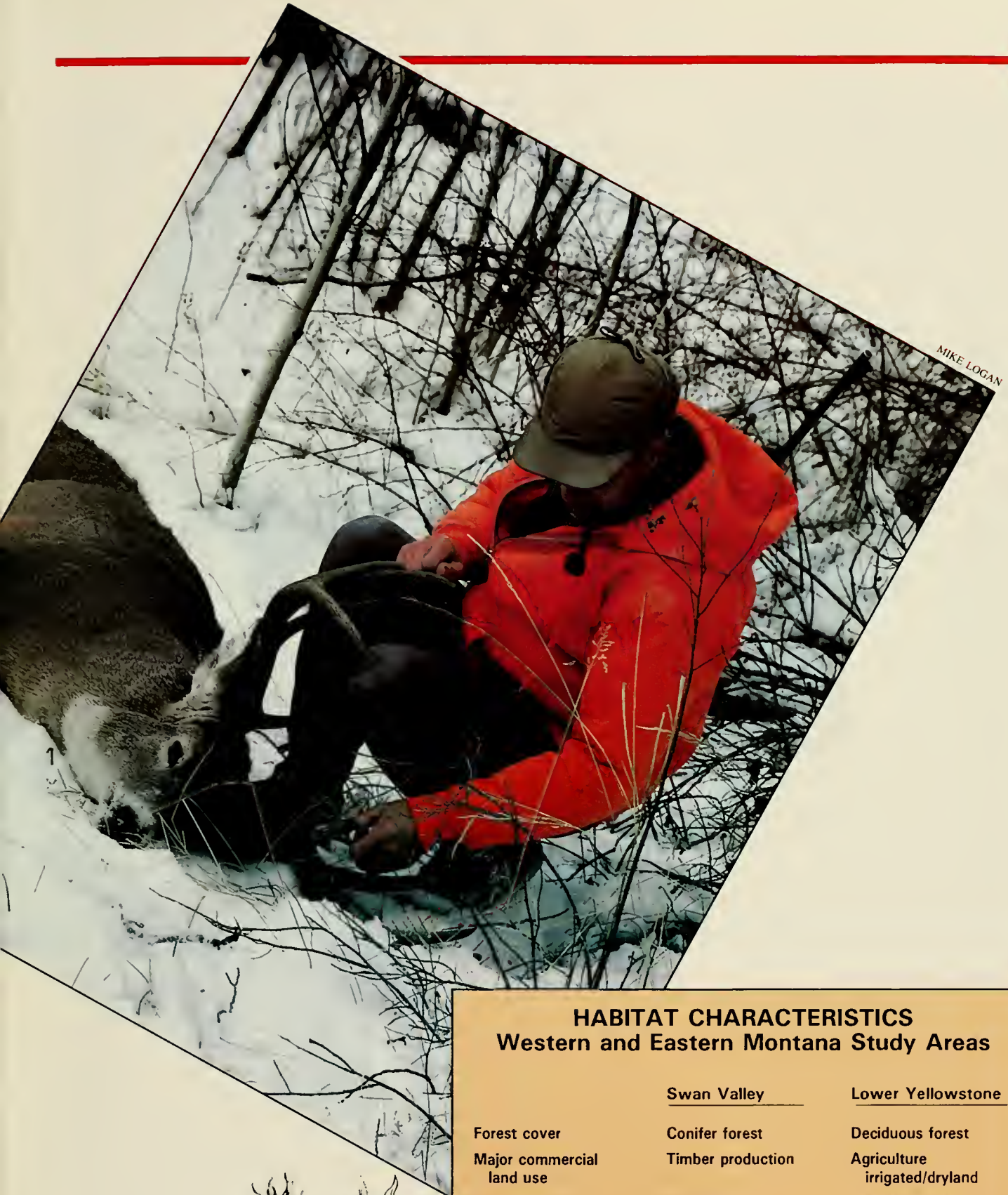
White-tailed deer are abundantly represented both in scientific and popular literature. From this, much has been generalized concerning their life history and ecology. Considering the diversity of landscapes and climate to which deer have adapted in Montana alone, such generalization may lead to erroneous conclusions about factors influencing numbers and trend. The effects of climate and other environmental conditions are often overshadowed by more visible cause and effect relationships—primarily hunting, natural predation, and starvation. Also, behavioral attributes that enable deer to respond and adapt to diverse environments often receive little attention.

The purpose of the Department of Fish, Wildlife & Parks' wildlife research program is to improve the way we do business in maintaining viable and healthy wildlife populations for all to enjoy. Research has been enhanced by advances in technology, particularly radio telemetry and computers. Telemetry offers a dependable means of locating and monitoring individual animals. It facilitates monitoring movement and habitat selection patterns, and aids in measuring population size. Individual transmitters function reliably for up to five years. To more precisely determine the time of death as well as the specific cause, some transmitters are now equipped with switches that change the signal pulse rate when an animal has died.



Various computer models have been developed to estimate animal abundance using individually marked animals. Adaptation of these models for use on personal computers has brought us a long way toward more effectively estimating population size. More recently, remote photography techniques (see *Montana Outdoors*, May/June 1990) have shown much promise for monitoring occurrence, group composition, and relative abundance of animals in heavy cover, such as the coniferous forests of western Montana.

In the past, game managers saw little value in censusing deer because of difficulty in observing a predictable and significant proportion of them in a given habitat. Following a widespread decline in deer numbers across the western states in the early to mid-1970s, particu-

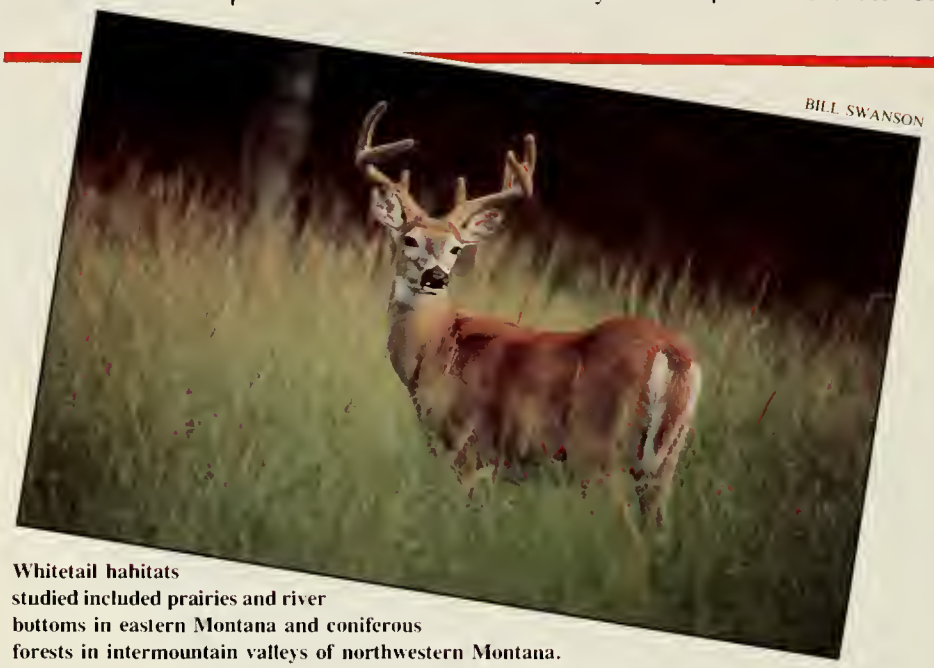


HABITAT CHARACTERISTICS
Western and Eastern Montana Study Areas

	Swan Valley	Lower Yellowstone
Forest cover	Conifer forest	Deciduous forest
Major commercial land use	Timber production	Agriculture irrigated/dryland
Winter duration	Mid November–March	Late November–early March
Mean January temp.	19°F	12°F
Mean July temp.	65°F	71°F
Mean annual precip.	22 inches	14 inches

larly among mule deer, in 1975 we embarked on a long-term project to identify all factors that influence population size and trend among both mule and white-tailed deer.

Sites representative of major habitats in which the two species occur were selected for comparative studies. Whitetail habitats included prairies and river bottoms in eastern Montana and the expanse of coniferous forest in intermountain valleys of northwestern Montana. The mission was to find out what contributes to population declines and to improve deer management across a large state with diverse habitats and land uses. Our base of knowledge at the time did not provide the answers despite what we thought we knew about deer. We needed to re-educate ourselves and answer questions such as: How do we measure and monitor population size? What factors in addition to quality and quantity of winter forage, individually or in combination, influence deer numbers and trend? What are the opportunities and constraints for managing deer in different habitats?



BILL SWANSON

Whitetail habitats studied included prairies and river bottoms in eastern Montana and coniferous forests in intermountain valleys of northwestern Montana.

Harvest trends offer some clue to the general trend in whitetail numbers over the past 30 years. This is particularly true of the antlered buck harvest, because hunting regulations for bucks have changed less than those for does and fawns. As one might expect, population trends in eastern and western Montana have taken somewhat different paths.

THE EAST

Current widespread distribution and abundance of white-tailed deer in eastern Montana and throughout the northern Great Plains has most likely resulted from significant changes in these habitats since settlement. Historical records, such as the journals of Lewis and Clark, suggest that whitetails, although locally abundant, occurred only sporadically along major rivers like the Missouri and lower Yellowstone in the early 1800s. Mid to late-19th century evidence, including the writings of Osborne Russell from the 1830s and photographs by L.A. Huffman from the 1880s, reveals sparsely wooded floodplains with little or no shrub understory. This undoubtedly provided slim fare for whitetails, considering their preference for a succulent diet of buds, leaves, and new stem growth of shrubs plus broad-leaved herbaceous forage. Heavy use of bottomlands by bison and elk (whose forage preferences were not quite as narrow), the introduction of livestock to the region in the late 1800s, and frequent fires probably all contributed to greater expanses of native grasslands along stream courses than exist today.

Availability of deer forage and cover undoubtedly varied widely in a region characterized by substantial annual and seasonal fluctuations in precipitation and temperature. The presence of an effective predator such as the gray wolf probably also limited distribution and numbers of whitetails. Although Theodore Roosevelt's writings in the late 1800s proclaimed whitetails to be denizens of the stream bottoms, they were most likely restricted to bottomlands and drainages with adequate shrubby forage and woody cover.

Market hunting during the 1860s and 1870s essentially eliminated bison and elk from the Great Plains and also reduced deer numbers across the region. Charles Messiter, who traveled through the Judith Basin in the mid-1870s, wrote that more than 1,700 deer, including whitetails, were taken by four men for the skins alone from the Snowy Range. Whitetails were scarce in eastern Montana from the 1870s until the mid- to late 1940s.

The floodplains along major rivers in the northern plains today provide diverse and stable habitats in a region marked by simple vegetation and topography and a highly variable climate. The elimination or reduction of bison and elk and subsequent agricultural development improved habitat for whitetails in bottomlands. Limited grazing by livestock also favored development of cottonwood forests along some rivers. Agricultural cropping practices probably facilitated invasion of upland prairies by whitetails, particularly where tree and shrub cover were abundant nearby. Along with restricted hunting (deer seasons were closed in much of eastern Montana from 1917 to about 1945), the stage was set for proliferation of whitetails in the 1940s and 1950s.

Today, deer are found all along the Yellowstone and Missouri rivers and their tributaries and are locally abundant

in the prairies and mountain foothills. Average density of whitetails is generally high along these river bottoms—on the lower Yellowstone, as high as 67 animals per square mile, compared with fewer than 15 whitetails per square mile in nearby prairie habitats.

Today, whitetails are closely entwined with agriculture and private land ownership throughout the eastern two-thirds of the state. Minimizing crop damage has been a major force influencing their management, and efforts to balance deer numbers with landowner tolerance are reflected in relatively high harvests of antlerless deer during the mid-1970s and again in the mid-1980s. Harvest trends in eastern Montana suggest several important phenomena. First, they attest to an increase in both numbers and distribution of whitetails in recent decades. The more variable harvests east of the Rockies also suggest a more pronounced ebb and flow in deer numbers than in western Montana. This, in part, reflects greater habitat variability in environments occupied by the Dakota whitetail.

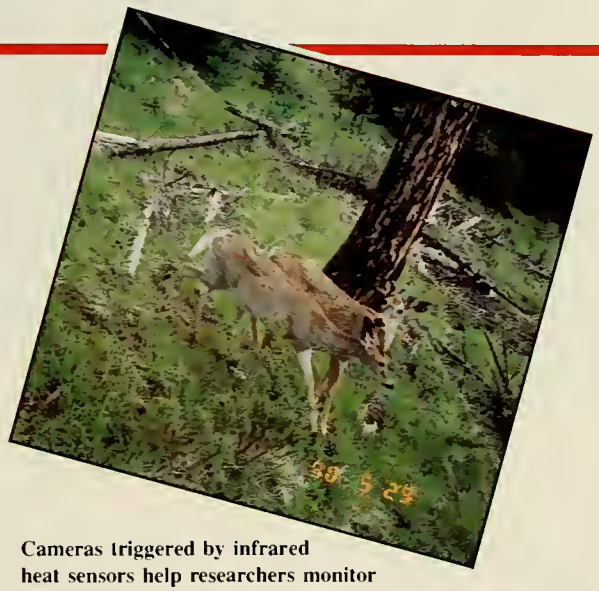
Between 1980 and 1986, population characteristics and habitat relationships of white-tailed deer were studied along the lower Yellowstone River in eastern Montana between Glendive and Sidney. Of 465 deer captured and marked, 141 were equipped with radio collars. The following are some of the salient findings:

- Population numbers doubled from 1980 to 1983 and declined through 1986.
- Approximately 93% of all females older than fawns bore young. Fawns accounted for 32% to 43% of autumn populations. Reproduction varied less here than in adjacent prairies during the same period.
- Mortality of newborns over summer averaged 32% of all fawns produced and varied directly with numbers of adult females in the population. (Mortality of 59% of newborns was reported in the Swan Valley of northwestern Montana, markedly higher than along the Yellowstone.)
- The male segment was relatively young, with fewer than 1% of antlered bucks older than 3 years.
- Hunting accounted for 81% of all mortality among deer older than 6 months, or 13% to 35% of autumn populations.
- Yellowstone whitetails were generally non-migratory, using year-long home ranges less than 320 acres in size. This contrasts with whitetails in much of western Montana, which commonly move 10-25 miles between traditional summer and winter ranges.
- Agricultural crops accounted for 41% of the year-long diet and generally replaced natural forage where they were readily available. Crops used by deer included alfalfa, sugar beets, and small grains.
- Relative abundance of woody cover, amount of island area, and livestock presence all influenced the distribution of deer. Abundance of woody cover may also explain differences in deer densities between river bottom and prairie habitats. Wooded draws composed only 3% to 7% of prairie habitats, whereas tree/shrub communities made up 24% to 40% of river bottom habitats.
- A pattern of selective foraging on agricultural crops and native forage during winter and negligible overwinter mortality indicated the population was holding its own nutritionally. Predictable movements from woody cover used during daytime to agricultural fields after dark showed successful accommodation to man's activities.

These observations were not consistent with traditional concepts of natural regulation involving winter forage, in that neither quality nor quantity of winter forage limited the lower Yellowstone whitetail population. In river bottom environments, population size may be regulated behaviorally through allocation of forage and cover by adult females. In the absence of hunting and natural predators, numbers would be reduced through lower fawn survival and higher attrition of females older than 8 years and males older than 4 years.

The sedentary nature and small home ranges of adult females indicate adaptation to locally stable habitat conditions. The most efficient behavior would be to remain on a familiar piece of range large enough to provide adequate food and cover. Availability of irrigated alfalfa on the river bottom compensates for shortages of natural forage during dry years. This probably contributes to higher survival of newborn fawns than that observed on the more open prairies.

Hunting contributed significantly to the decline in whitetail numbers on the study area from 1983 to 1986. Other factors related to natural mortality of adult females did not change in response to animal abundance. Although the proportion of antlered bucks removed by hunting (58%) during the study had no apparent effect on overall population trend, removal of 30% to 33% of females older than fawns resulted in population declines. Removal of 26% of yearling and older females roughly maintained female numbers at the same level from year to year, while harvests of less than 20% were followed by population increases. Increased harvests



Cameras triggered by infrared heat sensors help researchers monitor whitetail distribution and behavior in heavy cover.

from 1982 to 1985 were the result of comparatively liberal bag limits for does and fawns that included multiple permits per hunter in 1984 and 1985.

THE WEST

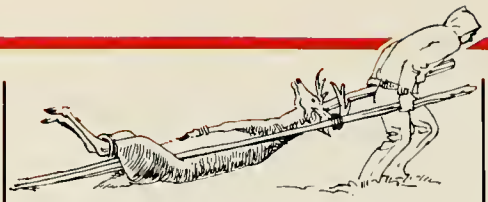
Western Montana's intermountain valleys are characterized by more moderate summer and winter temperatures and locally heavier snowfall than those experienced in eastern Montana. Logging is a major land use on the federal and state forest lands that make up more than 60% of the western Montana land base. Floodplains along some of the larger rivers are in agricultural use.

Whitetails were presumably abundant in this area in the early 1800s when explorers passed through. In the 1940s, whitetails were more abundant west of the Divide than on the east side. Numbers have generally increased over the last four decades, with some ups and downs. A population trough was recorded in the mid-1970s, followed by a fourfold increase over the last 16 years. Lower harvests of antlerless deer after the mid-1970s coincided with more conservative harvest regulations. Jim Cross, regional FW&P wildlife manager in Kalispell, feels a gradual increase in whitetail numbers has stemmed from subtle changes in habitat following logging on summer ranges in the 1950s and early 1960s combined with a series of average to mild winters.

John Mundinger, FW&P researcher in the Swan Valley from 1975 to 1984, provided a good scenario of how whitetails use the intermountain valleys of northwestern Montana (see *Montana Outdoors*, Sept./Oct. 1979). The Swan winter range, a relatively small area including bottomlands along the Swan River and adjacent uplands, receives light snowfall. Most deer leave the winter range as snow recedes in spring and arrive on traditional summer ranges just prior to the onset of fawning. Both summer and winter home ranges are relatively small, approximately 160 acres, but they are separated by anywhere from three to 45 miles. Winter foods are limited to natural forage, including Oregon grape, Douglas-fir, and arboreal lichens.

As mentioned earlier, fawn production is somewhat lower west of the Divide, probably due to poorer quality of forage on the winter range and the nutritional demands of long seasonal migrations. Although a habitat-use strategy involving migration may seem inefficient for deer, it is perhaps the best one for the environment of western Montana. Many areas, especially at higher elevations, are buried in deep snow during winter, and thus are inaccessible to deer. However, these same sites are readily used by deer during spring, summer, and fall. Topographical and climatic conditions in eastern Montana do not mandate such migrational movements, although deer in some environments may move slightly to accommodate climatic variation between seasons and years. Because mortality rates of adult deer are lower in western Montana, high rates of fawn production may not be necessary to maintain stable populations. Harvest data also suggest relatively stable whitetail populations in western Montana.

A renewed research effort began in 1987 in northwestern Montana to monitor whitetail population size and trend and to measure responses to timber harvest regimes and various levels and strategies of hunter harvest. Since January of 1988 we have captured and marked nearly 400 deer in the Salish Mountains northwest of Kalispell and equipped approximately 100 of them with radio transmitters. Through radio telemetry, we can determine habitat characteristics that influence distribution and abundance, monitor the extent, timing, and specific causes of mortality, and arrive at better population estimates. Photography has also been used to aid in estimating numbers and herd composition (relative proportion of bucks, does, and fawns). Preliminary findings indi-

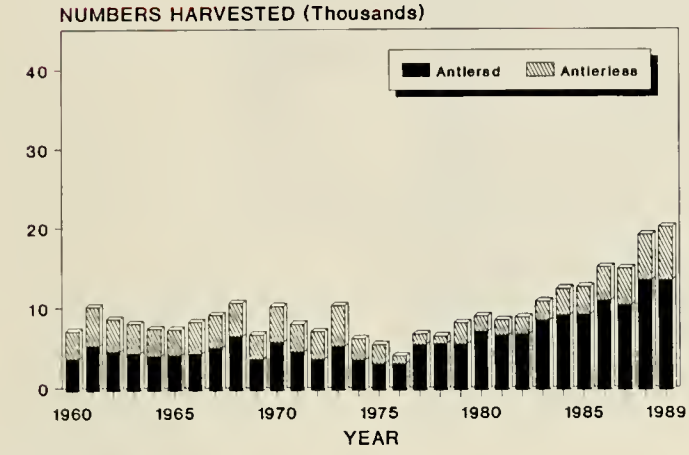


LEE KAISER

REPRODUCTIVE CHARACTERISTICS
Western and Eastern Montana Study Areas

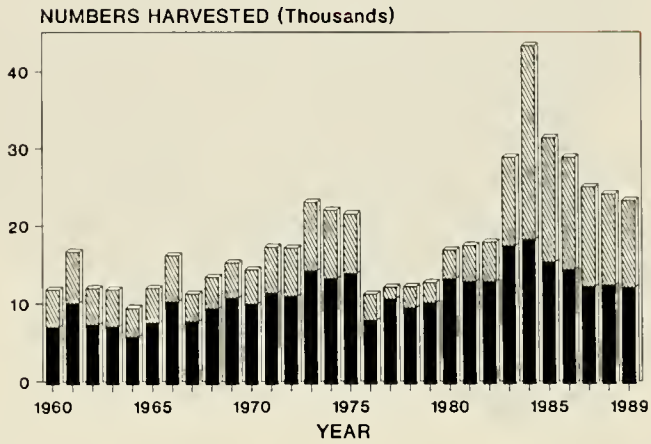
	Swan Valley	Lower Yellowstone
Pregnancy rate	96%	93%
Young / adult female at birth	1.5	1.8
% Rearing success among 2-yr.-old does	less than 50%	67%
Mean newborn fawn mortality	59%	32%

WESTERN MONTANA



Regions 1 and 2

EASTERN MONTANA



Regions 3,4,5,6, and 7

MONTANA WHITETAIL HARVEST, 1960-1989

cate that average deer densities on core winter ranges exceed 100 deer per square mile. Densities are much lower than this across the expanse of summer ranges. Annual mortality of adult does has been 16% over the past two years.

WHAT HAVE WE LEARNED?

Differences in behavior and function of whitetails in eastern and western Montana represent responses to broadly dissimilar environmental conditions (topographic, climatic, and vegetational) and land ownership and uses. Although harvest regulations have influenced composition and total harvest in both areas, dissimilar harvest trends reflect these environmental differences. Western Montana is characterized by a stable environment with predictable resource outputs, and as a result, whitetail numbers remain somewhat constant over time. In eastern Montana, however, where a fluctuating environment is the rule, deer numbers show more pronounced peaks and valleys. Research on whitetails in eastern Montana also suggests that hunting may significantly affect population trend. This is good in the sense that when populations need to be reduced to minimize damage to crops, it can be done expediently. In such instances, caution should be taken to ensure that a calculated reduction doesn't continue to unacceptable levels.

In western Montana, population changes have been more subtle. There is probably a time lag between habitat alteration and an observable change in population trend. The effect of current levels of timber harvest on deer populations, negative or positive, may not be readily apparent for some time. Therefore, current research in the region is intended to identify all habitat characteristics to which deer respond. Then managers can focus on maintaining the integrity of the attributes that favor deer.

Our long-term effort, together with numerous independent studies of shorter duration, offer an improved picture of how whitetails operate on both sides of the Continental Divide. One might say that Montana whitetails occupy two different worlds—that is, they use their environments differently as reflected by yearly movement patterns, habitat selection, population stability and abundance, and rates of reproductive success and mortality. What does the future hold for whitetails in Montana? Predictions usually end up making fools of those tendering them. Perhaps the key lies in a close re-examination of the past tempered with state-of-the-art technology. At present, all indications suggest the whitetail is currently doing well in both worlds.■

T. REX RISES AGAIN

by Kay Morton Ellerhoff

IN A STATE KNOWN FOR ITS WILDLIFE SUPERLATIVES THIS IS THE BIGGEST ONE EVER THAT DIDN'T GET AWAY.

We were traveling back into time on a gravel road. It was June 20, 1990, but we were going back to an unnamed month 65 million years ago. This country north of Jordan is tortured, with erosion's sorcery turning rocks into mushrooms and other spooky shapes. It's a convoluted piece of earth that seemed the sort of place *Tyrannosaurus rex* could call home.

The invitation had come from Shelley Abbey, marketing director for the Museum of the Rockies in Bozeman, to visit a spot north of Jordan to view the excavation of an amazingly complete *T. rex* skeleton. It didn't take much for photographer Donnie Sexton; Jim Liebelt, the department's information officer in Glasgow and videographer for the day; and me to say yes.

We lucked out. The crew had been barraged with media all week—from writers for Montana dailies and the Associated Press, to a NOVA crew and photographers from Washington, D.C. The day we were there, it was a video crew from the Denver Museum of Natural History until about 10 a.m. Then it was just us.

We lucked out in another way, too. Jack was there. Jack is Jack Horner, curator of paleontology at the museum and Montana's Dino Sleuth. You've heard the expression about reporters—"He has a nose for news." Jack has a nose for dinosaurs. His discoveries of the dinosaur nesting colonies at Egg Mountain rewrote the dino book. His research into duckbills, Ceratopsians, and some smaller carnosaurs at the Two Medicine formation north of Augusta; his discovery of oreodonts near Townsend; and his chance of finding a brontosaurus that could end up bigger than the Jordan *T. rex* have added new pages to the aforementioned dino text. He's not fond of hordes of reporters, but he seemed pretty comfortable with just the three of us. And the history of this country and of this incredible creature unfolded.

IT'S HARD TO BELIEVE NOW, BUT 80 MILLION YEARS AGO, the middle of this continent was a shallow sea. When it wasn't under water, it was part of a hot, humid, tropical coastline of marshes, river deltas, and swamps with dense vegetation. It was probably much like Louisiana's southern coast today. Fossil remains tell us that turtles, crocodiles, lizards, toads, fishes, small primitive mammals—and dinosaurs—lived on this coastal plain.

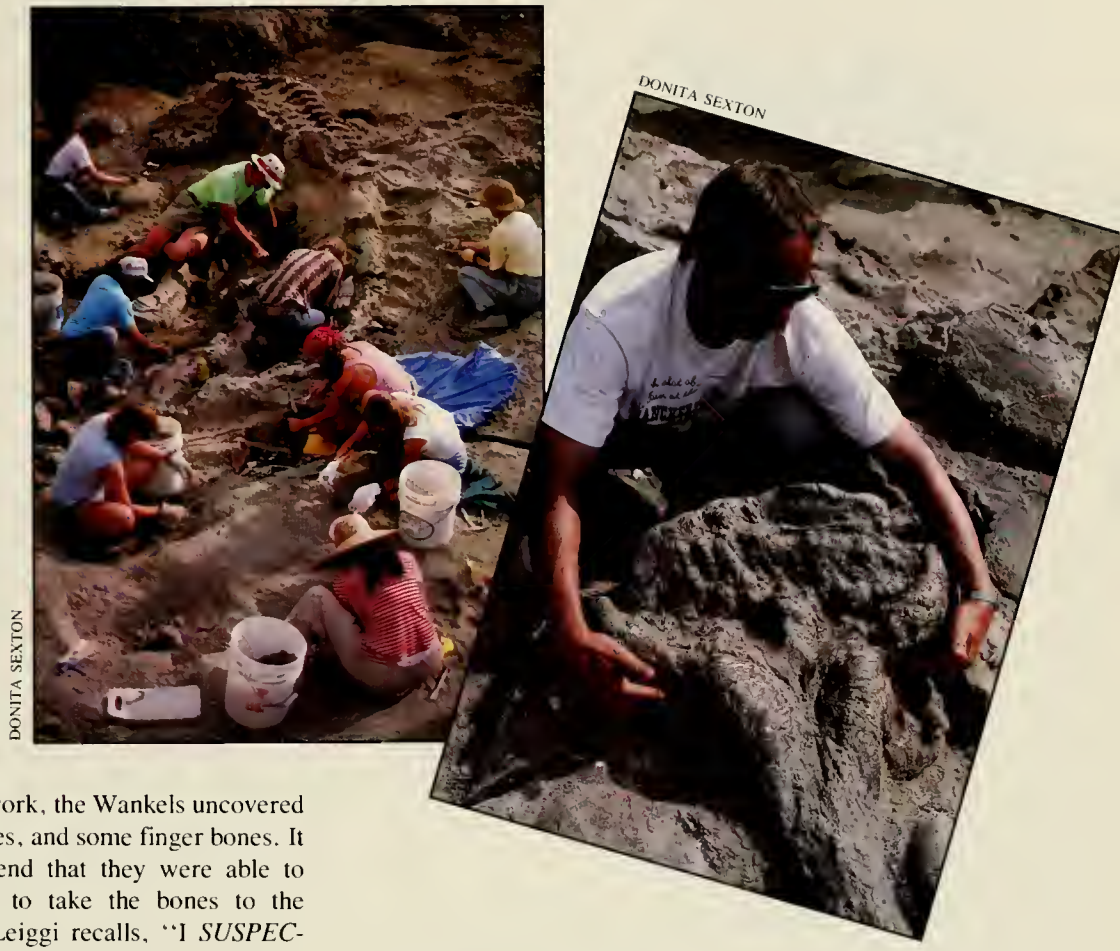
Many of the most complete dinosaurs on display in the world were gathered in Garfield County, of which Jordan is the county seat. The first *T. rex* skeleton came out of its hills in 1902. In fact, four of the eight Tyrannosaurs found in the world have come from Garfield County.

The *T. rex* was the largest land carnivore of all time. Depending on which source you believe, adults weighed as much 14,000 pounds or 16,000 pounds, stood up to 18 or 20 feet tall, and were 36 to 40 feet long. Thick-set and muscular, they were crowned by a four-foot-long head filled with—and on this sources agree—pointed teeth six inches inches long and serrated on both edges. Horner maintains that *T. rex* was probably more of a scavenger than an active killer of other dinosaurs.

Pat Leiggi, project director for the dig and the museum's chief preparator for paleontology, said, "This is the most complete skeleton of any *T. rex* found. Ever. Period."

The story of how it was found involves interest, luck, and, of course, Dino Sleuth's sense about these things. Tom and Kathy Wankel ranch about 35 miles from the post office at the tiny town of Angela, some 30 miles north and a little west of Miles City. On Labor Day 1988, they, their three children (Lee, then 8; Rocky, then 5; and Whitney, just 1 and barely walking), and other family members were camping and picnicking at Fort Peck Reservoir. The relatives agreed to watch the kids, and Tom and Kathy set off to look for fossils.

Kathy had been hunting fossils for about four years, and Tom was a recent convert. It was about 9 o'clock in the morning with that peculiar flat light common to the gumbo badlands when Tom found his first piece ever. Up a little higher, a narrow ridge of bone about an inch wide with three little tips sticking up out of the hardened ground caught Kathy's eye. It turned out to be a piece of the *T. rex*'s scapula (shoulder blade) on its edge.



A professional crew (right) carefully uncovers the most complete *Tyrannosaurus rex* skeleton ever found. Pat Leiggi (far right), chief preparator for paleontology at the Museum of the Rockies, points to the location of the eyesockets.

After a couple of weekends of work, the Wankels uncovered an upper arm, two lower arm bones, and some finger bones. It wasn't until Thanksgiving weekend that they were able to break away from ranch chores to take the bones to the Paleontology Lab in Bozeman. Leiggi recalls, "I *SUSPECTED* we had a chunk of a large carnosaur, but Jack could tell right away we had a *T. rex* arm and some other parts."

The arm of the *T. rex* is short—about the length of a man's. That was one of the most startling things about seeing this massive pile of bones in the Garfield County gumbo—a creature almost 40 feet long, with an arm barely longer than my own. Leiggi elaborates, "Matt Smith of our department has been working on the biomechanics of the arm. I hope he'll be able to tell us how that arm could have been used. So far, he's been able to tell us it's pretty powerful, and its biceps would probably have been about 10 times as strong as a human's. Since its arms weren't long enough to capture prey, the forearms could have been used to secure its prey. It should have claws, but we haven't been able to find any. They've been found with other specimens, though."

The four *T. rex* skeletons not found in Montana were found nearby, two in Canada and one each in South Dakota and Wyoming. Leiggi speculates the Jordan specimen died elsewhere and a flood washed it into a streambed or river channel. "It probably took a good wash to get all this sediment over it—which is really good for us. Rapid burial is best. That's how you get well-articulated animals [the bones are still attached]. We're finding fossilized plants typical of any river channel or lake along with this animal."

Leiggi told us the overburden was really something. Before the crew could begin the fine work with paintbrushes and ice picks you see in the pictures accompanying this article, they had to remove the overburden—"with jackhammers, rolling boulders, any old way we could think of to get it off," Leiggi added.

ABOUT THIS TIME, JACK SUGGESTED A THREE-QUARTER MILE TREK across the badlands to see a Triceratops skull about to be lifted from its 65-million-year-old resting place. (The Triceratops was a horned, plant-eating dinosaur which may have been prey for the Tyrannosaurus.) As we walked, he confessed he often ran into things like trees because his eyes were always on the ground. "No danger of trees out here, Jack," we affirmed. He told us about the Phyllis B. Berger Dinosaur Hall, which opened at the Museum of the Rockies September 15 (see sidebar). And then he got going about the *T. rex*.

"The other *T. rex* skulls I've seen have little spikes that sit right over the eyes, right over the orbits. Also, the nose area is really gnarly; there are a lot of canals, blood vessels, and other stuff coming into something. This one has neither—there are no spikes over the eyes, and the nose is pretty smooth. Some of the other specimens are almost as large as this one, but their pelvic areas are small by comparison. So I think this one is a female."

We asked him about what they ate, their skin, what sounds they made. He told us *T. rex* could move both upper and lower jaws, and it could unhinge its jaws as well. "What this means is that they could just gobble food right down. They could also unhinge parts of their skull, which of course means they could get down bigger prey, bigger chunks of meat."

He continued, "We've gotten impressions of other dinosaur skin, but not of *T. rex*'s. We know what it looks like, but we

A section of dinosaur skeleton, encased in plaster, is hoisted by front-end loader to a waiting truck for the trip to the museum.

BRUCE SELYEM

just don't know what color it is. It is an awful lot like alligator skin. They don't have scales. When they were born, it's possible they had some kind of downy covering. They would lose that when they got bigger, because they didn't need to be insulated."

"Dinosaurs make sounds," Horner stated. "I think a lot of sound was made by blowing air through their nasal chambers. The adult's noise sounds like a roar, but the baby noise is more like a 'tweet' because their nasal chambers are tiny. High-pitched, squeaky noises by babies, deeper pitched honking sounds for the adults. In a herd situation, they almost have to be able to communicate with each other and make noise to alert the other members of the community. If parents are caring for the babies—and I believe they are—the babies would have to cry to indicate they want food."

When I got back to Helena the following day and transcribed my notes, I was amazed at his use of present tenses: "The dinosaur is...they don't have...are tiny." That's why Dino Sleuth keeps stumbling across these things; for him, they're still alive, and he's able to bring them to life for anyone who listens to him.

ON THE WAY BACK TO THE *T. REX* SITE, we started to wonder how they were ever going to get the largest carnivore of all time out of the ground and back to the museum. Leiggi told us the road we had driven in on had been cut by the U.S. Army Corps of Engineers. He guessed the skeleton would be cut into eight sections—hip, the back, the head, a shin, the right foot, the left foot's toes, a section of the tail, and a section of the tail containing the animal's lower jaw. The sections would be encased in plaster, and then the creature would be loaded via equipment provided by the corps onto a truck provided by Bill McKamey, the owner of Willimac Trucking in Great Falls who is also Abbey's brother. (With the benefit of five months' hindsight, we're pleased to report the skeleton arrived—intact—at the museum on July 3.)

Horner said the skeleton will be displayed just as it was found for the next three years or so while Leiggi's crew separates the bones from the rock and hardens them. All of this will be in full view of the public. Abbey noted, "What we'll have is basically a working paleontology lab." Horner said he would like to see the *T. rex* reassembled and then cast in bronze. It could hold court outside the museum and serve as an invitation to come inside and see Dino Hall.

It's not a 10-ton dinosaur lying in a bed of green clay that will rewrite the books, as one newscaster characterized it. But it *IS* a showpiece. It's something that people will want to come to Montana and to the museum to see. Simply put, it's a 65-million-year-old pile of bones given another chance at life.■

Museum's Dino Hall Opens

If you go to the Museum of the Rockies' Phyllis B. Berger Dinosaur Hall to see skeletons, you'll be disappointed. But not for long.

You'll see a re-creation of a day 80 million years ago in the dinosaur nesting colonies on Egg Mountain near Choteau. Instead of skeletons, you'll see scenes of life. The exhibit features a life-sized replica of a 3,000-pound duck-billed dinosaur feeding berries and branches to her foot-long babies. A three-foot Troodon is looking for an opportunity to sneak in and steal an egg.

The exhibits have been designed to depict as accurately as possible the exact conditions at Egg Mountain. Museum of the Rockies Marketing Director Shelley Abbey said, "More than 160 individuals contributed to the exhibit. Volunteers spent hours and hours picking grass out of the moss we used in the exhibits, because there was no grass then—it hadn't evolved yet. The very first flowering plants were just appearing."

The Museum of the Rockies and Dino Hall are open from 9 a.m. to 5 p.m. Monday through Saturday, and Sunday from 1 p.m. to 5 p.m. Admission is $3 for adults, $2 for children from 5 to 18 and Montana State Univeristy students, and $10 for a family; children under 5 are admitted free.

Before the hall opened, Jack Horner, curator of paleontology at the museum, confided, "It will be nice. Real nice. It will be the best museum dino exhibit in the world—guaranteed." Who's going to argue with Dino Sleuth?

Major Moves

After 21 years with the Montana Department of Fish, Wildlife & Parks, **Ron Marcoux** has resigned from his position as deputy director to work for the Rocky Mountain Elk Foundation in Missoula. "As I leave for a new challenge," Marcoux said, "I do so with a great sense of pride and accomplishment in the department and its personnel. The bond developed with the department is a strong one and will remain throughout my life." Marcoux accepted the position of land resources coordinator at the foundation and began work in late August.

Pat Graham was promoted to fill the position of deputy director for staff operations. Graham, who began his career with the department in 1977, was Fisheries Management Bureau chief, Fisheries Division administrator, and associate director before his promotion.

Al Elser, FW&P supervisor in Region 1 (Kalispell), has been selected to fill Marcoux's vacated position. Elser has also been with FW&P for 21 years; he was fisheries manager in Region 7 (Miles City) and chief of the Fisheries Management Bureau in Helena.

Replacing Elser as Region 1 supervisor is **Dan Vincent**, who had served as Region 4 supervisor (Great Falls) since 1983.

In addition **Rich Clough** moved from supervisor of Region 8 (Helena) to supervisor of Region 2 (Missoula), and **Norm Peterson** left his position as supervisor of Region 7 (Miles City) to supervise the Helena region.—*Bridget Moylan, intern, Conservation Education Division, Helena*

Ron Marcoux

Ohrmann Sculpture Benefits Montana's Watchable Wildlife

He holds the bronze of fox and kits in his work-roughened hands and smiles at the finished work. A brass tag on the walnut base simply states, "Montana's Watchable Wildlife, by Bill Ohrmann."

"Yes, I think this will be fine," Ohrmann says softly. Standing outside his ranch house near Drummond in western Montana, he turns the bronze toward the sunlight. The reddish hues of the foxes glow.

The foxes represent the first in a series Ohrmann is donating to Montana's Watchable Wildlife Program. Each will be a limited edition of 50 bronzes. Proceeds will go into a watchable wildlife fund for education and interpretive projects for wildlife and fish species, as well as to help Montana's nongame wildlife.

"For years, I thought about donating to the nongame check-off, and it always slipped my mind," he says, explaining that it's difficult to remember when turning tax preparation over to an accountant. (The nongame check-off appears on each year's tax form and provides an opportunity for Montanans to help fund projects for nongame wildlife—those species not generally hunted, trapped or fished.)

Born in Philipsburg, Ohrmann moved

DEBORAH RICHIE

Bill Ohrmann with bronze sculpture

with his family to a ranch near Ovando. In 1934 he bought the ranch that he and his wife Phyllis still run today. A cattle rancher, Ohrmann cares about all the species on his land. "When we lose an animal, we always drag it up on the hill and give it to the coyotes," he says. He never shoots coyotes, respecting what he views as their beneficial role to his ranching operation by clearing gophers out of draws.

Ohrmann is a gentle, unassuming person who explains simply that he has "a sympathy for wildlife." He likes to hunt and keeps the freezer full for the winter, and he wants to be sure the land will stay healthy enough to support all kinds of creatures. On his open pastures and wooded draws, he notices where does raise their fawns, when a bear has passed through the upper meadow, and how many kits foxes raise each year.

Wildlife provides a continuing source of inspiration for his art as well. He began by whittling with a pocket knife on his family's ranch near the Blackfoot River. "I always had the urge to draw, to paint, and to carve," he says. Without any formal training, Ohrmann started carving big, bold cottonwood sculptures of bears, elk, pronghorns, and others. About 20 years ago, he was mentioned in Dave Crowell's "Montana's Own," a collection of vignettes about Montana artists. He began meeting other artists, going to shows, and eventually moved from wood to bronze sculpture.

His work has earned first prizes in

DEBORAH RICHIE

Bronze fox and kits (6 inches tall, 10 inches long) by Montana artist Bill Ohrmann

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western art shows in Missoula and Kalispell, as well as in a five-state show in North Dakota. Yet, his success as an artist has never taken him away from ranching responsibilities. He points out that putting in two hours of sculpting at the end of each workday gives him 14 hours a week. Sometimes he puts in more time if he's particularly inspired.

"It puts a little more life in you to do creative things," he says. The Ohrmann's living room indeed appears alive with sculptures, not only of wildlife but also of cowboys on horses and farmers and children with animals. "Artists have the ability to influence people with their work," he says, "and maybe they should."—*Deborah Richie, nongame information specialist, Conservation Education Division, Helena*

Donation Benefits Medicine Lake NWR

Members of the E.B. Shawver II family of Wichita, Kansas, recently attended a Ducks Unlimited dedication of a Montana waterfowl habitat enhancement project at the Medicine Lake National Wildlife Refuge (NWR).

Long-time supporters of DU, the Shawvers provided $154,500 toward development of the 1,440-acre Katy's Lake project in northeastern Montana's Sheridan County. The Medicine Lake NWR is an important waterfowl production site, as well as serving as a major stopover point for migrating waterfowl.

Working with the U.S. Fish and Wildlife Service, DU constructed a 1.7-acre earthen nesting island in Katy's Lake, providing improved production habitat in a portion of the refuge lacking natural islands. In addition, an existing water-control structure was replaced to better manage water flow, and a fish barrier was put up to prevent carp from entering the lake. In 1990, waterfowl nesting success on the island was 97%.

DU has completed more than 40 habitat enhancement projects in Montana and more than 20 additional projects are in various stages of development.—*Gary Koehler, Ducks Unlimited*

Bob Watts: Always the Biologist

A small island of buffaloberry bushes lay before us in a coulee no more than 50 yards wide, the first shrubs we had seen since leaving the truck a mile behind. It appeared as though an endless sagebrush blanket surrounded the struggling creek and countless shallow side

Bob Watts, 1940-1990

drainages. It was mid-September and exceptionally hot; small beads of sweat began to form on his forehead, just below the closely cropped hairline.

"Olson," he said, "there are more sharp-tailed grouse in those bushes than you can ever handle." As usual, he was right on the mark. My shooting was the subject of numerous jokes that day, and Bob tried his best not to embarrass me. I remember one comment went something like this: "I believe those bombers [sage grouse] are waving good-bye to you as they disappear over the horizon." I mumbled something about the safety being stuck on my new shotgun. He didn't laugh at me, but his eyes had a twinkle that gave away his thoughts about my hunting skills.

The day ended with a couple of birds in my game bag and a limit in his. A photo album now displays those memories of 12 years ago and my first sage grouse. Other pages are full of good times too numerous to count.

Bob Watts was always the biologist; his vast knowledge of the Missouri Breaks country never failed to amaze me and I always managed to learn from him, whether the occasion was business or pleasure. His wisdom varied from range plants to paleontology, always seasoned with years of experience and a genuine wit. He cared deeply for the natural resources of our world, including people. I will always be grateful for the help and consideration from the veteran biologist who always had time and energy to help the "new man in Region 4."

But there was another side to Bob probably more important to me as a biologist: his constant questioning of any project or proposal that we might suggest. He made me see the need for constructive criticism and in-house group discussions of hunting season proposals or anything else of scientific merit. He was the sportsmen's conscience in central Montana and beyond. Nothing delighted "Watts" more than an in-depth discussion of wildlife issues at the local pub with his friends. And, rest assured, that if he debated an issue, it was approached from all angles.

So, a premier wildlife biologist has left us, but fond memories of his concern and dedication to our profession gives us all something to strive for. So, Bob, this is a salute to you from up north. May the sage grouse always flutter in front of your dog and the antelope watch vigilantly as you pass among them.—*Gary Olson, FW&P biologist, Conrad*

LWCF Celebrates Silver Anniversary

Many Montanans may not recognize the significance of an important silver anniversary being celebrated this year, but those who recreate at many of Montana's city parks, state recreation areas, and other recreational sites certainly should.

That's because 1990 marks the 25th

anniversary of the federal Land and Water Conservation Fund (LWCF), established as a funding source for the federal acquisition of authorized national park, conservation, and recreation areas, as well as to provide grants-in-aid to state and local governments and Indian tribes to help them acquire, develop, and improve outdoor recreation areas and facilities.

In Montana, more than 750 projects, representing close to a $60 million investment of federal, state, and local dollars, have been completed. Public recreation opportunities have been created and enhanced through the state park system and many communities across the state.

Statewide, almost all of Montana's 60 state parks have benefited from LWCF funding, including Lewis and Clark Caverns, Giant Springs, Bannack, Canyon Ferry, Makoshika, and others.

But local, county, and city governments have been the real LWCF winners. Almost every county in the state has received some funding and numerous cities and towns have realized the program's benefits. Swimming pools, tennis courts, and sports complexes, including playgrounds and baseball diamonds, have been among the most popular developments financed with LWCF dollars. But golf courses also are exceedingly popular. Courses have been built with LWCF cost-sharing funds in Whitefish, Kalispell, Missoula, Helena, Hamilton, Harlowton, Roundup, Powder River County, and Baker, to name a few.

Since lands acquired or developed with LWCF grant assistance are protected for outdoor recreation use in perpetuity by the act, the program assures a nationwide recreation and conservation legacy for the enjoyment of future generations.

Since 1980, federal funding of the program has steadily declined to an all-time low. Several bills are under consideration by Congress to restructure the program in an attempt to restore funding to a level more comparable to the national need.

Poachbusters

The world's poaching industry generates $1.5 billion a year. Poachers and dealers in illegal skins or tusks often get away with their crime because prosecutors have difficulty linking crook to animal. Law enforcement officials fail to identify 80% of the evidence that comes before them: They may recognize a purse as being made of crocodile skin, but they cannot tell what type of crocodile it is and, thus, whether it is protected.

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This may now change, thanks to the U.S. Fish and Wildlife Service (USFWS). In Ashland, Oregon, the agency has opened the first "crime lab" to investigate the trade in wildlife. For years, conservation groups have complained that wildlife forensic experts are overworked and underfunded. The need grew in 1981 when Congress amended America's anti-poaching law to include protected animals killed in other countries.

The $4.5 million laboratory has three groups of clients: federal agencies such as the Customs Service and the USFWS; the 50 state fish and game agencies; and the 105 countries that are members of the Convention on International Trade in Endangered Species. The laboratory uses forensic methods to link the blood, tissue, bone, fur, or claws of a protected species to such things as leather purses, processed meat, and fur or leather coats. More than half the cases involve ivory. The process is much like a police forensic laboratory: matching suspect, victim, and crime scene.

The laboratory has to determine what sort of animal lost its skin or tusk. This can be tricky if all there is to work with is a leather watch band or ground-up rhino horn. One way is DNA analysis, a technique still in its infancy. Forensic scientists have so far been able to determine an animal's sex (only in mammals) and species from its genetic material. But they can do this only if the sample contains remnants of untreated blood or tissue. The acid used in tanning destroys the evidence.

The ambitious goal is a genetic map of individual animals. This would allow officials to seize a bearskin in a warehouse in Miami and match it with a kill in Yellowstone. But to identify a Yellowstone grizzly bear, a scientist needs to know what the likelihood is of two randomly selected grizzly bears having the same DNA sequence. For that he needs to have examined the DNA sequence in bears from say, Yellowstone, Kodiak Island, and the Yukon.

Using this evidence forensic scientists can develop a statistical model on the probability of that bear's origin. Steve Fain, chief DNA specialist at the laboratory, hopes that by autumn enough work will have been done on bears, sheep, and deer to trace genetic characteristics down to an individual animal.

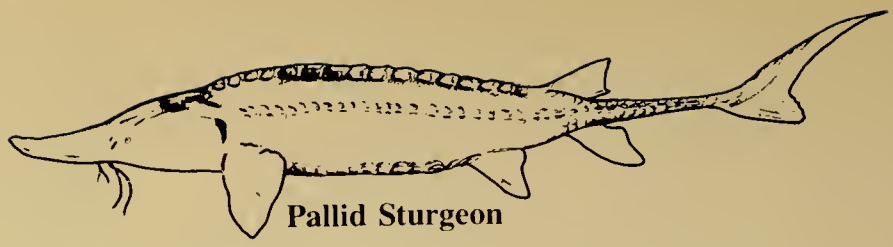
All this requires a huge collection of material: 3,000 blood and tissue samples are kept at -80° C to match against other evidence. Another warehouse is stacked with 50,000 trinkets of leather, tortoiseshell, and ivory. The 22 members of the staff include 10 forensic scientists and a cryptologist who cracks poachers' computer codes.

The laboratory, which does not charge for its services, has already helped with a number of convictions—but its director, Ken Goddard, will not say how many. It has another, unplanned benefit. It is a repository for golden and bald eagle feathers. American Indians who need feathers for religious rituals but are not allowed to kill the birds may request feathers or a carcass. At least 1,000 Indians are on the waiting list.—*reprinted from* The Economist *(London), June 16, 1990*

Pallid Sturgeon: Officially Endangered

The pallid sturgeon (*Scaphirhynchus albus*) has the dubious distinction of being the first Montana fish listed as endangered under the Federal Endangered Species Act. On September 6, 1990—more than two years after receiving a petition from the Dacotah Chapter of the Sierra Club to list the pallid sturgeon as endangered—the U.S. Fish and Wildlife Service added this native Montanan to the federal list of endangered species.

The pallid sturgeon is an ancient, large, bottom-dwelling fish originally found throughout the Mississippi-Missouri rivers. It is very similar to the shovelnose sturgeon—except that the shovelnose is abundant. The pallid has the look of a dinosaur, with five rows of large bony scales (scutes) running the length of its body. The head is flattened and it has an extended and somewhat



Pallid Sturgeon

pointed snout. The mouth is on the underside of the snout. It can extend and retract its mouth, so it functions like a vacuum cleaner, picking up an assortment of food including aquatic insects, crustaceans, mollusks, fish eggs, and other fish. The barbels, sensory organs in front of the mouth, are important in the feeding process because this species is adapted for life in turbid water where seeing is difficult.

Pallids probably survive in three river reaches of Montana: (1) the reach of the Missouri River upstream from Fort Peck Dam to Fort Benton, (2) the Missouri River downstream from Fort Peck, and (3) the Yellowstone River downstream from Forsyth. These three areas will undoubtedly play key roles in recovery of the species since they are relatively long stretches of free-flowing river—a rare commodity in the Missouri-Mississippi system.

The number of observations of pallid sturgeon has declined dramatically over the past three decades. In the 1960s, there were approximately 500 pallid sturgeon observations between Fort Peck Dam and Gavins Point Dam some 1,000 river miles downstream. The number of observations dropped to 209 in the '70s, and plummeted to 56 during the '80s.

In 1988, two pallids were seen in the Yellowstone River near Savage; five separate fish have been seen on several occasions by research biologists and recreational SCUBA divers below Fort Peck Reservoir since 1988. The most recently observed pallid in the Missouri upstream from Fort Peck was seen in May of this year. These few sightings indicate the precarious position of the pallid.

This drastic reduction in numbers is probably related to a number of factors. The most important reason is loss of river habitat through construction of mainstem Missouri River reservoirs and channelization of the lower Missouri River channel to facilitate barge traffic. Approximately 990 miles of river—or 28% of the pallid's entire range—has been impounded by the six mainstem Missouri River dams. Another 1,810 miles of river—51% of the pallid's range—has been channelized for benefit of the barge industry.

The bulk of the remaining range is in short regulated reaches downstream from reservoirs. As noted above, the exception is in Montana where the pallid lives in fairly long, unimpeded reaches of the Missouri and free-flowing Yellowstone. The habitat alterations have adversely affected the species by blocking movements to spawning and feeding areas, destroying spawning areas, changing the condition and flow of remaining spawning sites, reducing food availability, and altering river bottom conditions necessary for survival of the species.

As already mentioned, the pallid sturgeon shares its river environment with a closely related and similar looking species, the shovelnose sturgeon (*Scaphirhynchus platorynchus*). The shovelnose is much smaller, reaching a maximum length of 30 to 32 inches and weighing 10 pounds or less. Recorded weights of pallids have topped 60 pounds. Unfortunately, pallids weighing under five pounds are easily confused with the shovelnose.

In an effort to protect the pallid sturgeon, Montana's fishing regulations require that any sturgeon weighing over 16 pounds must be released. While this requirement provides a guideline to anglers to recognize and release the large pallids, smaller specimens are not protected. The two species can be distinguished by fairly subtle differences in position of the barbels in the front of the mouth. Although Montana fishing regulations contain diagrams showing these differences, many fishermen may not feel confident of their ability to make the distinction.

Because the pallid has been listed as endangered, it is now illegal to take or possess one of any size. New fishing regulations which will become effective in March 1992 will require release of all pallids. Fishermen will be required to more carefully identify their catch and to release fish if they are uncertain of the species.

What will listing the pallid sturgeon mean? Recognition of the species by listing encourages conservation actions by federal, state, and private agencies, groups, and individuals. For example, representatives of federal and state agencies and other entities will cooperate in development of a restoration plan. In addition, any proposed action by a federal agency likely to jeopardize the continued existence of the species must be closely scrutinized.—*Chris Hunter, chief, Special Project Bureau, Fisheries Division, Helena*

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UP THE CREEK AND OVER THE MOUNTAIN

by Bernie Kuntz

Photo by Louis M. Kis

It's been a dozen years since I climbed that unnamed goat mountain where the two billies lived, but I remember the mountain well, its grassy benches and willow-choked slides and the icy rills that came off its shoulders. I also remember the incident on that trip that first surprised me, then angered me.

The stalk was an unorthodox one in the first place. Four of us were hunting together, and two of us carried rifles and hunting licenses. The other two were along for the experience. So when we spotted the goats, Ed, the organizer of our trip, decided we should split up—Ross and I would climb to a grassy bench above the goats; Bruce and Ed would come from below if they could stay out of sight.

The trouble was that they couldn't stay out of sight, and the billies spooked while Ross and I were in the final stages of the stalk. Gasping for breath, we dashed to the edge of a rocky outcropping just in time to see the billies moving at a fast walk about 150 yards away and perhaps 100 feet from a ridge that would put them out of sight. I caught my breath as best I could, dropped into a kneeling position, used a boulder for a rest, and fired. The largest billy dropped, then rolled over and over on the mossy carpet until it stopped at the edge of a rock slide. The other animal looked for a moment, then disappeared over the ridge.

"I wish Bruce would have been up here, too," I said to my partner as we caped the head and lashed the meat to the pack frames. "He could have taken the second billy, no problem."

Two hours later we stumbled off the mountain beneath our heavy packs, and when we joined Ed and Bruce, both were still upset. Ed, the man who suggested the stalk in the first place, was almost livid. "Why didn't you shoot the other goat for Bruce?" he demanded.

A verbal altercation followed, in which I told him that it was not only illegal but unethical, and that I didn't expect to be cross-examined for not shooting another hunter's game. The trouble simmered down, but we never hunted together again. A difference of opinion existed among us as to what constituted proper hunting ethics.

Now, when a person writes an essay on ethics, it might be assumed that the writer is ethical, sort of like having a teetotaler write an essay on temperance. Well, basically, I am ethical, although I won't deny that I sipped from the jug a time or two in the past, and I don't like to remember those times. So don't get any ideas that I am "casting the first stone," so to speak, because I live in a house with windows, too.

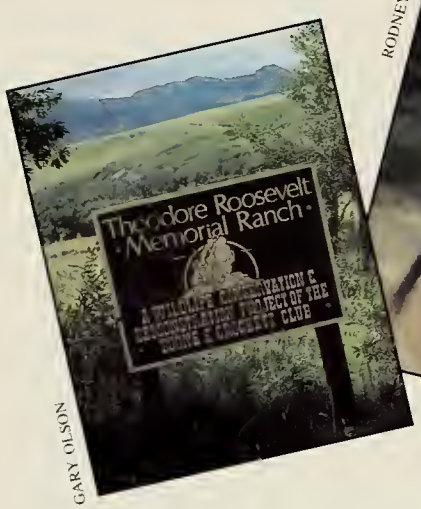
Still, I like to think of myself as an ethical hunter—I buy the proper licenses, I don't exceed my bag limit, I hunt in the right areas and while the season is open, I don't throw beer cans in the creek, and that sort of thing.

But actually, the subject of ethics goes a lot deeper than operating within the law. Proper ethics is a matter of attitude, of respect. Do you, as the late Robert Ruark wrote, "...properly respect what you are after, and shoot it cleanly and on the animals' terrain...?"

continued on page 20

Bulls

THE RAGHORN BULL DANCED NERVOUSLY from one foot to the other as we counted off the seconds. "Four minutes and he's starting to dance, just like I told you," came the triumphant cry over the helicopter intercom. It was Dick's subtle way of reminding me that this new tranquilizer would



GARY OLSON

RODNEY SCHLECHT

GARY OLSON

MIKE LOGAN

work better than anything we had ever used on elk. At six minutes the bull staggered forward a few steps and then sank to his knees under a wind-worn limber pine.

Just minutes earlier, we had spotted our subject in a small group of elk near a grassy meadow on the Boone and Crockett Club's 6,000-acre Theodore Roosevelt Memorial Ranch (TRMR). Our pilot handily maneuvered the Hughes 500 into position to dart the bull. Dick, who happens to be a veterinarian as well as a darn good shot, loaded a stainless steel dart into the capture gun and leaned out over the skids on the plane. "A little closer!" was all I could hear before the wind whipped his words away. I can remember thinking, as one does in critical situations, that he was plenty close enough—I didn't want to bulldog this critter, just dart him.

The Hughes moved to within 15 feet of the running elk, and I could faintly hear the report of the capture gun. The dart stuck on the edge of the rump patch, and its colored end wobbled up and down in time to the bull's easy loping rhythm. We pulled up and back about 500 yards to wait. I had checked my watch when Dick fired so I could get an exact reaction time. The immobilizing drug Dick used, Carfantenil, has a unique effect on big game animals: They display a characteristic "dance" or shuffle, and this young bull was no exception.

"He's down!" I yelled, and the helicopter moved to within 200 yards before easing down into the deep grass. As I slipped the plastic collar containing a small transmitter over the sleeping bull's neck, Dick was busy getting blood samples and checking for injuries that could have resulted from the chase. Analysis of blood enables us to identify diseases the animal might have.

After a complete once-over, the patient was given an

On The TRMR

by Gary Olson

antidote, and we moved away to watch his reaction. After 60 seconds his eyes and ears began to move; at 90 seconds we were pushing him to an upright position. Bulls always seem more reluctant than cows to get up after they have been tranquilized, so we pitched in and gave him a hand. At 120 seconds, he stood and glared at us before trotting off a few yards.

There's something else that this drug does to an elk, especially bulls; they become very curious—not aggressive or mean, just curious. This woozy raghorn followed us back to the helicopter and seemed determined to hop a ride in the strange bird that had pursued him minutes earlier. Only by waving our arms and yelling expletives that only a muleskinner would understand could we convince him to return to the herd.

This process was repeated three times during the day with a variety of younger bulls. At last I had four radio-collared bulls, enough to start the monitoring project that had financial support from the Boone and Crockett Club, the Rocky Mountain Elk Foundation, and the Montana Department of Fish, Wildlife & Parks. Dr. C. Les Marcum, associate professor of wildlife in the University of Montana School of Forestry, provided valuable expertise in habitat mapping, computer analysis, and study design.

OUR STUDY WAS DESIGNED TO IDENTIFY SEASONAL RANGES and migration paths of bulls wintering on the TRMR. The information would be used to fine-tune elk hunting regulations along the Rocky Mountain East Front and to provide the Boone and Crockett Club with information about the elk using their property. Radio information from previous studies was available on cow elk, but until 1987, no bulls had been monitored.

The TRMR lies along the east slopes of the Continental Divide where the mountains reach out to the rolling grasslands of eastern Montana, about 85 miles northwest of Great Falls. The three forks of Dupuyer Creek drain eastward through the narrow foothill zone from the sheer overthrust formations which are nicknamed the East Front. Approximately 1,000 mule deer and 350 elk winter here on windswept grassy ridges; winter forage is continually swept free of snow by warm, southwesterly winds, often called chinooks.

Many other big game species also frequent the area. Grizzly and black bears, mountain lions, goats, and bighorn sheep can be found on or adjacent to the ranch. The Rocky Mountain wolf is sighted with increasing frequency, attesting to the richness and overall quality of the habitat here. It is undoubtedly one of the most important big game winter ranges along the east slope of the Rockies.

SO ON A WINDY MARCH DAY IN 1987, we set out to capture and collar four bulls. The idea was to sample a variety of bulls, from calves through adults, so we could identify differences in habitat needs and movement patterns. Twelve additional bulls and four cows would be collared during the course of the three-year baseline project, bringing our total to 20 animals.

The radio signal from the collars is picked up by scanner/receivers as a steady beeping sound. A Piper Supercub with a belly-mounted antenna is utilized to monitor the positions of elk. We tried to fly twice a month, but we frequently had to cancel because of treacherous winds along the mountain front.

Before each relocation flight, we load the radio frequencies into the scanner. This allows us to activate all frequencies at once; when the plane approaches one of the collared animals, that frequency will be picked up and we'll hear a beeping sound. The closer the plane is to the elk, the louder the beeping. The pilot makes increasingly smaller flight circles around assumed locations until the elk is either seen or pinpointed in an area smaller than 10 acres. This procedure avoids wasted flight time and duplication of effort. Map coordinates and other information about habitat are logged for each animal and entered into a computer data base.

You might be thinking this sounds pretty scientific. But let me describe the human element of this flying business. Fact: Those of us who are not veteran fliers tend to feel uneasy about soaring into steep canyons while our pilot chats glibly about downdrafts, windshear, ice in the carburetor, and—of all

GARY OLSON

GARY OLSON

The TRMR elk study is yielding valuable information on elk seasonal ranges and migration paths. Two of 16 bulls radio collared since 1987 have been harvested illegally—the collar at left was found on the Blackleaf Wildlife Management Area. Blood samples taken from tranquilized elk (below) are analyzed for disease.

things—the mechanics of a stall maneuver. If that doesn't get you, the circling will; normal relocation of a radioed elk takes an average of six circles around the animal before a reliable location is logged. A simple mathematical equation verified by your stomach tells you that on an average flight of three hours, you have experienced the equivalent of 34 days on a roller coaster.

Experience really helps with perspective. Over the past few years, I have learned when to continue flying and when to head home. The body has subtle ways of letting you know it's time. For instance, if you break out in beads of sweat and the temperature is only 60°F inside the cabin, it's time to go home. If your stomach growls but you're not hungry, it's time to go home. If the pilots kids you about how pale you look, it's too late to go home. You have then entered the aviation twilight zone and are completely at the mercy of your pilot. With luck, you have paid the flight bills regularly.

WHILE THEY WERE STILL ON THEIR WINTER RANGES AND EASILY SPOTTED, finding the collared elk was easy. However, when May rolled around, things became much more complicated. Research conducted during the early 1980s showed that radioed cow elk on this winter range used portions of the Bob Marshall Wilderness. That knowledge at least gave me a place to start. Sure enough, during May and June of 1987, radioed bulls and cows either stayed on the TRMR or traveled to the Bob Marshall Wilderness, approximately 20 air miles to the west in the upper reaches of the Middle Fork of the Flathead River. It was immediately obvious that young bulls moved around more than cows, and this mobility increased as the summer progressed.

All of the four collared bulls were yearlings. Two stayed in the Flathead River area, one moved northward toward Glacier National Park, and the other moved 20 miles south, to the North Fork of the Sun River. Both of the traveling yearling bulls set up housekeeping on new winter ranges, one on the Sun River Wildlife Management Area, approximately 40 miles south of the TRMR, and the other near the southern edge of Glacier National Park, 35 miles northwest of the ranch. The two bulls that did not venture out of the Bob Marshall were harvested by hunters during the bugle season in late September.

Six bulls—five yearlings and one 2-year-old—were darted in the same manner and radio collared in March of 1988. Their summer ranges were in the same general area of the Bob Marshall as the bulls collared in 1987. Of the six bulls, one disappeared and could not be found, three were killed during the regular hunting season (Oct. 23-Nov. 27) near the TRMR, one was taken during the bugle season (Sept. 15-Sept. 30) in the Bob Marshall Wilderness, and one survived until April of 1989, when he was found dead on the winter range. It was frustrating that only one bull survived that year's trapping effort and that so little information had been gathered on the bulls that were shot. On the other hand, I was beginning to see the effects of hunting on bulls in this area.

We darted and radio collared six more bulls and three cows in March of 1989. By this time, I could pretty well guess where these animals would summer, based on the previous two years' work. By mid-June, four of the radioed bulls had disappeared and no amount of flying turned them up. August rolled around and I was getting desperate; there was no way that four radio collars could fail all at once, so they had to be some place that a reasonably intelligent biologist would look.

A rancher friend of mine reported a rumor about elk being seen in The Nature Conservancy's Pine Butte Swamp Preserve, about 12 miles south and east of the TRMR, along the Teton River. With a "what-have-I-got-to-lose" attitude, I checked it out and readily located all the bulls in dense Teton River cottonwood stands and swamp brush—not typical East Front elk summer range by a long shot. Regardless, the bulls each had seven or more girlfriends and their calves—all of this in an area elk were not known to frequent.

Most of these elk remained in the area until the end of the

hunting season and then headed back to the TRMR and the Blackleaf Wildlife Management Area. No elk hunting is allowed in the hunting district surrounding the Pine Butte Swamp, mainly because there were never any elk. Lots of possibilities exist for explaining this shift to a new summering area. One might be less livestock use of the swamp and Teton River since The Nature Conservancy took over. Another might well be that elk move in directions of least resistance for any number of unknown reasons, or that it was merely a random movement that resulted in a dandy place to spend the summer.

If the small herd uses the swamp again, Fish, Wildlife & Parks had better start talking to adjacent landowners about the possibility of a limited harvest as the population grows more accustomed to alfalfa and grain. Without the radio collars, we would not have known the origin or number of elk using the area and probably would have been forced to react to game damage complaints a few years down the road. Now, we can plan how to handle the situation before it becomes a problem.

The 1989 hunting season passed with one legal and two illegally harvested bulls. So far, no collared bull remaining in the area has survived past 3 years of age. Of the 16 collared bulls, 44% have been legally harvested, 13% have been taken illegally, 13% have died in the winter, 13% have an unknown fate, and 19% are still alive. This has made it difficult to accumulate more than one year's information on any individual animal.

Movements of bulls will continue to be monitored for another year, thanks to generous support from the Rocky Mountain Elk Foundation, Boone and Crockett Club, and FW&P. Information from this project will be a big help in achieving elk population and harvest goals. Future generations of hunters, photographers, hikers, and nature lovers will benefit, thanks to the cooperation and dedication of these conservation organizations.■

Up the Creek and Over the Mountain

continued from page 15

Ruark said that if a hunter kept in his mind all the wonder of the day, from the sky to smell to breeze to flowers, then he hadn't merely killed an animal. Rather, the hunter had lent immortality to a beast so that he would always remember the day.

That is the way to feel about hunting.

If you do not hunt, you must understand that the sport of hunting is relatively solitary in nature. Hunting is certainly not a spectator sport. A hunter is on his own with no referee, umpire, or audience in sight. The law is on the books, but the hunter is alone with just himself and his conscience. He must navigate with his maps, compass, and his ethics.

Hunting should not be competition between hunters. It may be a competition between animal and hunter—the matching of wits and senses in which we humans are so woefully inferior—in an outdoor setting. As long as we remember that, we have a better chance at being ethical hunters. When we become obsessed with records and numbers rather than the outdoor experience of hunting, we denigrate the noble activity of hunting to the level of a two-bit arcade game.

Hunting should be for those who don't need to prove anything to anybody. What matters most is that you have gone up the creek and over the mountain. You have smelled the sagebrush, drunk from the cold springs, and slept beneath the conifers. You have walked the tundra, climbed the mountains, and cooked over an aspen fire. Just because you haven't killed an animal doesn't mean you have failed, for the only "failures" in hunting are those who don't respect the land and the game.

Too much is made today, in some circles at least, about which trophies a hunter may have, and how long of horn or antler they are. Now, I've got trophies on my wall, too, but none are in the Boone and Crockett record book, and I doubt if I ever will have a trophy large enough to qualify. I don't really care as long as they look good to me. I have some very good trophies that I'm proud of; I also have some mediocre heads that I'm equally fond of because no matter how old and wrinkled I get, those mounted heads will represent a time in my life when I was young, tough, and had legs like iron, a time when I could walk and climb all day, come back to camp for supper, and then be ready to go at it just as hard at first light.

Those are my trophies—not dead animal heads, but living memories of some of the best days of my life. As I politely told a hunter at a house party not long ago who informed me that "no ram under 40 inches is a trophy," trophies, like beauty, lie in the eye of the beholder. Big heads are fine as long as we don't let them undermine the real reason we are there, in the field, hunting. For then our ethics will begin to suffer. A hunter may take shortcuts to get the big head, and he may be miserably dissatisfied with anything less than an outstanding specimen.

Oversize trophies are impressive, but if you really want to impress me, fish a beer can out of a creek and put it in your pack. Tell me how you are teaching your son or daughter to shoot and to appreciate the out-of-doors. Show me your rifle and tell me the prettiest stretch of country you've ever hunted and why you like it.

Soak up the experience of hunting. Hunt so your memories are right with you in your heart, for that is the real meaning of proper ethics. Don't let anyone try to make you apologize for lack of trophies, because just as neckties and tweed suits don't make a gentleman, neither mere experiences nor trophies make a sportsman.

Try to "do it right" every time, for therein you will find the true meaning of hunting ethics. Hunt the animal with respect and even with reverence if you can, not with indifference or callous disregard. Even then you might have trouble explaining "proper hunting ethics," but you will know the meaning. I promise you that much. You will know.■

CRAIG JOURDONNAIS

A Montana Department of Fish, Wildlife & Parks game warden looks over evidence collected in the course of investigations in Cascade County.

Poachers Feel THE STING of the Law

by William Phippen

"Five arrested on 16 poaching charges,"
"Ill gotten game: Six face charges in poaching sting,"
"Poachers earn stiff sentences," "Seven netted in sting."

From the spring of 1989 through the summer of 1990, these headlines and more perked the ears of legitimate sportsmen and sent poachers scurrying as the Department of Fish, Wildlife & Parks undertook intensive strikes against those who would steal from Montanans to satisfy their personal greed.

That the department has taken a more intensive and visible stand to apprehend and prosecute those who commit such gross violations of wildlife laws reflects the changing environment in which Montana's valuable wildlife heritage will live and the ways in which those who are charged with protecting that heritage will operate in the decade of the '90s.

"We're not overlooking any of our important functions," Erv Kent, administrator of FW&P's Enforcement Division, said in explaining the successes of recent months in curtailing serious poaching activities. "But we have been putting a greater amount of emphasis on the more serious violations." The additional effort to curtail serious violations, including the use of undercover or "covert" operations by FW&P game wardens, is a priority, he said.

Consider that over the past year and a half enforcement operations to apprehend serious game law violators have led to cases in Missoula, Ravalli, Fergus, Teton, Dawson, Garfield, Park, Yellowstone, Rosebud, Wibaux, and other counties. And some were spawned by apparently "gross violations," indeed.

The following cases document a toll on Montana's wildlife that few, save the alleged perpetrators, would condone:

- *In May, 1989, state game wardens arrested six western Montana residents as the result of a year-long covert operation*

in which authorities confiscated more than a dozen illegally taken big game heads and hides and disclosed an unlicensed, illicit poaching enterprise called the "Moonlight Guide Service." In Ravalli County, one area resident and the alleged operator of the guide service, was charged with four felonies and misdemeanors for taking two undercover agents on a guided bear hunt, which he was unlicensed to do and during which a bear was killed. He was also charged with guiding agents on nighttime mule deer and elk hunts, during which a deer and an elk were taken. He was further charged with selling the horns of an illegally taken bighorn sheep as well as the parts of other illegally taken wildlife. Others named in the case were charged with felony and misdemeanor counts relating to the illegal taking and trafficking of wildlife or their parts. The investigation led to subsequent arrests of individuals in Idaho.

- *"An undercover operation in southeastern Montana, initiated by a telephone tip from a concerned citizen via the department's toll-free TIP-Mont report hotline, led to the arrest in October 1989 of four Florida men and one from Alabama for the illegal taking, possession, and waste of wildlife. FW&P wardens arrested the men just after 6 a.m. on Saturday, October 28, when they checked their luggage, which included hundreds of pounds of deer and antelope meat, for their scheduled flights home. The accused face a total of four felony and 13 misdemeanor charges related to the illegal taking of at least 38 antelope and at least nine deer in Rosebud, Custer, Garfield, and Yellowstone counties. According to a statement made by the Rosebud County Attorney shortly after the arrests, the group came to Montana and illegally purchased Montana resident licenses before beginning their alleged shooting spree. Those activities resulted in a felony charge for four of the alleged perpetrators for trafficking parts of illegally killed game animals and misdemeanor charges for killing or possessing more than the legal limits for antelope, waste of meat by leaving it in the field, and using a license issued to another person. The group allegedly held only four antelope tags. The other defendant was charged with a misdemeanor for shooting a mule deer doe and tagging it with an antlerless white-tailed deer tag. An FW&P undercover enforcement agent spent time in the field to photograph, tape, and document the group's activities.*

- *In an unconnected case, three Florida men and two from the Wibaux, Montana, area were arrested in November 1989 following a year-long investigation of an alleged hunting ring that led from Florida to southeastern Montana. Most of the 16 charges against the men involved the illegal taking of deer. Felony charges of trafficking in unlawfully taken wildlife and misdemeanor charges of hunting without a license, transferring of licenses issued to another person, possession of illegally killed game, and outfitting without a license were handed members of the group. A cooperative investigation by FW&P, the South Carolina Department of Wildlife and Marine Resources, and the Florida Game and Fresh Water Fish Commission led to the arrests.*

- *A one-year undercover operation resulted in the arrest in June 1990 of two men who were charged with the felony offenses of unlawfully selling black bears or black bear and antelope parts and several misdemeanors, including, on the part of one of the individuals charged, fraudulently acting as a licensed outfitter, illegally baiting black bears, hunting during a closed season and failure to keep records required of a licensed outfitter. The investigation was started to determine why the black bear population in that area, in particular, had decreased to such an extent that it had forced quotas to be placed on the taking of the bears.*

- *On Wednesday, August 29, 1990, six Montanans in Great Falls and a seventh in Billings were arrested and charged with felony and misdemeanor hunting violations following a year-long undercover investigation. Those accused had allegedly killed hundreds of game animals dating back several years. Enforcement officials said a department undercover agent infiltrated the poaching operation and had been buying illicitly taken game from those charged for several months.*

  "The figures are astronomical," said Bob Winfield, Warden Captain for FW&P in Great Falls. At the time of the arrests, he explained, the department collected a freezer full of meat from illegally killed animals and three truck loads of pelts, antlers, mounted heads, and other animal parts. Agents from FW&P, the state Justice Department, U.S. Fish and Wildlife Service, the Cascade County Sheriff's Office, the Montana Department of Livestock, and the Federal Drug Enforcement Agency assisted in the investigation and arrests.

  In an action that may affect charges in several of these cases, the Montana Supreme Court in September of 1990 ruled that the department's felony statute for fish and wildlife violations is unconstitutional. The department will approach the 1991 Montana Legislature to correct a flaw in the statute and reestablish the felony provision in law.

Where does all of this lead us? To the fact that FW&P and the people of Montana are not going to tolerate such blatant, illegal taking of wildlife.

K.L. Cool, Director of the Department of Fish, Wildlife & Parks, told the Billings Gazette last fall: "When someone is out there to cheat us or illegally take game with the full knowledge of what they're doing, we will use the maximum authority and power we have available to eliminate that kind of behavior.

"Those people," he said, "are out to steal from Montanans, to illegally use our resource base for their own personal profit, and they will be pursued by the department to the maximum extent possible."

But, according to Cool, being extra tough on serious violators doesn't mean that honest sportsmen should duck their heads and run for cover every time a game warden's truck appears on the horizon.

"We're working hard," said Cool, "to earn the respect of sportsmen and others who use our fish and wildlife resources and want them protected. We hope sportsmen will accept our wardens as friends of the wildlife resource, as friends sportsmen can talk to. Sportsmen are very important to us and we're working hard to form partnerships between wardens and sportsmen that will better protect Montana's fish and wildlife into the future.

"We expect to build that relationship with sportsmen based on the concept of mutual trust and respect," he said. "Sportsmen and landowners are the key to our enforcement successess."

Enforcement's Kent noted that sportsmen expect wardens to enforce the law, but they also expect them to use optimum educational efforts to reduce unintentional or unknowing violations.

"We recognize sportsmen want to enjoy their activities," he continued, "but at the same time they have told us they want to see the law enforced, or the quality of hunting as we know it in Montana today will decline."

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BOOK REVIEWS

PHEASANTS OF THE MIND: A Hunter's Search for a Mythic Bird, by Datus C. Proper, illustrated by Eldridge Hardie, Prentice Hall Press, 15 Columbus Circle, New York, NY 10023; 1990, 154 pages, hard cover, $18.95.

As the title hints, "Pheasants of the Mind" is not a conventional how-to manual on pheasant hunting. It's an extraordinary blend of reminiscence, insight, biology, and philosophy, with some practical advice about pheasant hunting thrown in for good measure. You know you're in for something different when you read Datus C. Proper's first few lines: "Hunting is not fiction, but it happens in the mind. It is the oldest and youngest thing in the world. It feels like dawn. Sometimes my teeth chatter while I am writing about it...."

The author devotes several chapters to past hunting experiences in such far-flung places as Nebraska, New England, Pennsylvania, and Ireland. Other chapters cover the nuts and bolts of pheasant hunting—guns, clothing, boots, and gear. But mostly the book is about the lure of pheasant hunting—the history, myth, and mystery of the bird itself. He says, "I'd rather hunt one bird than shoot many. I want sunburned grass, golden stubble, gray barns, red rose-hips, dogwoods turning purple, and miles to go before I sleep."

Of the pheasant, Proper writes, "American hunters have a complaint that I have heard in no other country. They object to the best of the pheasant: to its energy, speed, and resourcefulness, to the way it makes a dog use his brains." He explains that most conventional dog training wisdom emanates from the eastern U.S., where ruffed grouse and bobwhite quail have historically been the birds of favor. Because pheasants run more than grouse or quail, many trainers consider them ruinous to a pointing dog's staunchness. But he puts things in perspective this way: "There is a philosophical question too: Do you want the rules to be written by man or nature? ...You can spend years trying to fit pheasants to inappropriate rules, learning the hard way, and, when you finally have it right, being told by every expert that you are out of line. In the end, though, many hunters must have chased pheasants in the way I have described. . . .[Dogs] should allow clean kills over solid points. They should be eager, good to watch, and smart enough to hunt a very tough bird. Real pheasants are not impressed by human convention. They are impressed by wit and gun, legs that dance through cover and predator stare...."

Proper's book is an elegant tribute to a fine game bird and a thought-provoking meditation on the art of pheasant hunting.—*Dave Books*

A FIELD GUIDE TO MONTANA FISHES, by George D. Holton, illustrated by Glenn West and Harold (Rich) Stevenson, Montana Department of Fish, Wildlife & Parks, 1420 East Sixth Avenue, Helena, MT 59620; 1990, 103 pages, soft cover, $9.95 (plus $1.50 shipping).

As author George D. Holton says in the preface, this field guide is intended to provide a concise, easily understood handbook for identifying Montana fishes. As such, it should be a useful reference for fishermen, biologists, students, naturalists—in short, anyone interested in Montana's wild creatures.

The book consists of a simple visual key to fish families arranged by type and position of fins on the back. Within families, look-alike fishes are grouped for easy comparison. Color paintings of 30 Montana game and sport fishes aid in identification, as do black and white illustrations of other species. Distinguishing features for each fish are prominently displayed, and habitat characteristics and distribution maps are included.

Other useful information includes Montana fishing records, answers to commonly asked questions, scientific names of fishes, and a glossary. The beauty of this book is that it is complete and scientifically accurate, yet easy to use. The pages are printed on durable paper and saddle-stitched (stapled on the center fold) so that it can be opened flat without breaking the binding.

George Holton was chief fisheries biologist and assistant administrator of the Department of Fish, Wildlife & Parks' Fisheries Division for 30 years. He says the book is an assemblage of clues for fish identification compiled from many sources, augmented by his own observations as well as suggestions from numerous fisheries biologists. Holton, who retired in 1987, began the project as a department employee and completed it as a department volunteer.

This book is highly recommended for anyone interested in Montana fishes.

UP THE CREEK, History of Early Settlers on Rock Creek, Bonita & Quigley, by Darlene Olson, Valley Publishing, P.O. Box 88, Clinton, MT 59825; 1990, 224 pages, soft cover, $15.95.

American novelist Henry James wrote, "It takes a great deal of history to produce a little literature." And so it would be agreed by Montana writer and historian Darlene Olson who has researched the lives and legends of the early settlers from the Rock Creek, Quigley, and Bonita area of Montana and captured their stories in her book "Up the Creek."

After 12 years of living in the Rock Creek valley, Olson set out to record the legends of its people. "When we bought an old homestead on Rock Creek, I fell in love with the many stories and the old-timers who told them," Olson said. "Then, as these settlers died, and their stories were dying with them, I decided to record them before they were lost forever." With the help of a grant from the Rock Creek Advisory Council, Olson was able to pursue the project.

Those who settled in Montana survived in a rugged, undeveloped, and relatively foreign land. The Treasure State is a land blessed in wealth and resource, but also a land where danger is constant and natural disaster frequent. This was especially so in the 1800s and early 1900s.

"Up the Creek" contains 150 historical photographs which illustrate the trying yet rewarding lives of these first settlers. Although many of the photographs were borrowed from state collections, Olson obtained many unpublished photographs from the private collections of Rock Creek residents.

Released in June 1990, the book is now in its second printing.—*Bridget Moylan*

CONTRIBUTORS

• "The white-tailed deer is the best known, most widely distributed, and most intensively studied big game animal in North America." Turn to page 2 and **Gary Dusek's** exploration of "Two Worlds of the Whitetail." Following a decline in deer numbers in the western states in the early to mid-1970s, the Department of Fish, Wildlife & Parks embarked on a long-term project to identify the factors that influence population size and trend in both mule and white-tailed deer populations. As Dusek writes, "We needed to...answer questions such as: How do we measure and monitor population size? What factors in addition to quality and quantity of winter forage, individually or in combination, influence deer numbers and trend? What are the opportunities and constraints for managing deer in different habitats?" He further notes population trends in eastern and western Montana have taken somewhat different paths. Dusek is a biologist for the department in Region 1 (Kalispell). He received the Montana Chapter of The Wildlife Society's Communications Award this year.

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• The subject of ethics goes a lot deeper than operating within the law. It's a matter of attitude, of respect. As **Bernie Kuntz** writes, "Hunting should be for those who don't need to prove anything to anybody. What matters most is that you have gone up the creek and over the mountain." Take that journey—"Up the Creek and Over the Mountain"—with him in this issue's "Perspectives." Smell the sagebrush. Drink from cold springs. Sleep beneath the conifers. Climb the mountains. Cook over an aspen fire. "Just because you haven't killed an animal doesn't mean you have failed, for the only 'failures' in hunting are those who don't respect the land and the game." Kuntz recently joined the Montana Department of Health and Environmental Sciences as education coordinator. The previous associate editor of *Wyoming Wildlife* and a life-long hunter, Kuntz has also been a weekly outdoor newspaper columnist. Turn to his article on page 15.

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• "Bulls on the TRMR"is more than a report about seasonal ranges and migration paths of bull elk wintering on the Theodore Roosevelt Memorial Ranch. It's a glimpse of why this area is undoubtedly one of the most important big game winter ranges along the east slope of the Rockies. It's a peek at some of the other creatures—grizzly and black bears, mountain lions, goats, bighorn sheep, wolves—who live there. And it takes you along on an airplane ride as biologists are darting the bulls as part of the research project. **Gary Olson** even provides some guidelines for deciding if you should continue flying or head home: "If your stomach growls but you're not hungry, it's time to go home. If the pilot kids you about how pale you look, it's too late to go home." Turn to his article on page 16. Olson is a department biologist in Conrad.

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• In Montana, "Poachers Feel the Sting of the Law." From spring of 1989 through summer of 1990, Montanans saw headlines such as "Poachers Earn Stiff Sentences" and "Seven Netted in Sting." The Department of Fish, Wildlife & Parks undertook intensive strikes against those who would steal from the public to satisfy their personal greed. As **William Phippen** points out, in the past year and a half, enforcement operations to apprehend serious game law violators have led to cases in Missoula, Ravalli, Fergus, Teton, Dawson, Garfield, Park, Yellowstone, Rosebud, and Wibaux counties, among others. FW&P and the people of Montana are no longer going to tolerate the illegal taking of wildlife on such a blatant scale. Phippen quotes FW&P Director K.L. Cool: "Those people are out to steal from Montanans, to illegally use our resource base for their personal profit, and they will be pursued by the department to the maximum extent possible." Phippen's article begins on page 21; he is an information officer in the department's Conservation Education Division in Helena.

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• "Mitigation in the Flathead" is a big article, but then, it's also a big issue. As **John Fraley** writes, "In the Flathead system of northwestern Montana, government agencies are moving forward with a small but important part of the largest fish and wildlife mitigation effort in the history of the Pacific Northwest." Fraley points out that fisheries losses caused by dam operations are substantial and should be mitigated. Cost of mitigation will be significant and most will be borne by the electric rate payers in the Pacific Northwest. Success of many mitigation measures is uncertain because little precedent exists for efforts on this scale and because biological conditions are changing in the system. He looks at Hungry Horse, Kerr, and Bigfork dams. He looks at the complexity of the issues—FW&P, the Confederated Salish and Kootenai Tribes, and the U.S. Fish and Wildlife Service all have fish and wildlife management authority. He looks at some possible remedies. His article begins on page 27. Fraley is a fisheries program officer for the FW&P in Kalispell.

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• *Montana Outdoors'* "Nongame Sampler" series continues with **Tom Butts'** porcupine article. You'll learn some things you perhaps didn't know before—a really big porcupine can weigh 30 pounds. Although they're mostly found around trees, they're occasionally found far out on the prairie near extensive grasslands or in sagebrush basins. The quills are actually modified hairs with spongy interiors and sharply pointed, black-tipped ends. And speaking of quills—the porcupine does not throw quills as sometimes thought; instead, it raises its quills to defend itself and may use its tail to hit an attacker. Butts formerly worked for the department as a biologist in Roundup. Turn to "Quill Pig" on page 32.

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• *MO* thanks the following photographers for their contributions to this issue: **Harry Engels**, **Mike Logan**, and **Donita Sexton**, Helena; **Diane Ensign**, Whitefish; **L. Paul Jones**, Cut Bank; **Lee Kaiser**, **Louis M. Kis**, and **Bill Swanson**, Kalispell; **Mark Lagerstrom**, Darby; **Alan Nelson, Conrad Rowe** and **Rodney Schlecht**, Great Falls; **Bruce Selyem**, Bozeman; and **Mike Aderhold** and **John Fraley**, Kalispell; **Craig Jourdonnais** and **Deborah Richie**, Helena; and **Gary Olson**, Conrad, who work for the department.■

MONTANA OUTDOORS INDEX

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BOOKS REVIEWED

Building the Herd—as told by Bryan Hilger and written by Wendy Woollett, designed and edited by Patricia Kane (March/April).

Pheasants of the Mind: A Hunter's Search for a Mythic Bird—by Datus C. Proper (Nov./Dec.).

A Field Guide to Montana Fishes—by George D. Holton (Nov./Dec.).

Up the Creek—by Darlene Olson (Nov./Dec.).

FISH/FISHING/WATER

Eight Bite the Dust—Eight fish records were broken in 1989, and the rock bass was added to the state records list (May/June).

Old Fish, New Fish, Big Fish: The Changing Face of Flathead Lake—Will man or nature write the final chapter for the Flathead fishery? (Jim Vashro, May/June).

Of Ditches and Trout—How many trout are lost down irrigation ditches? The Catchall (Brad Shepard, May/June).

Our Point of View—It is no wonder the allocation of water among different users evokes strong emotions in many Montanans (Pat Graham, July/August).

Instream Flow on the Mighty Mo—Instream flow reservations on the Missouri are necessary to preserve its diverse fishery and related recreational opportunities (Liter Spence, July/August).

River Restoration Program: Rx for Recovery—The future of Montana's multimillion-dollar sport fishing resource depends on preserving and restoring fish habitat (Tom Palmer, July/August).

A World of Fishing Beyond Trout—Angler interest in warm-water fishing is on the rise (Phil Stewart, July/August).

Illegal Aliens—Illegal fish transplants are one of the biggest problems facing fisheries managers (Jim Vashro, photos by Mike Aderhold, July/August).

Lies My Guide Told Me—Guides never lie about the size of fish they catch themselves (Greg Tollefson, illustrated by Dave McGee, Sept./Oct.).

Mitigation in the Flathead—In northwestern Montana's Flathead system, government agencies are moving forward with a small but important part of the largest fish and wildlife mitigation effort in the history of the Pacific Northwest (John Fraley, Nov./Dec.).

Pallid Sturgeon: Officially Endangered—The U.S. Fish and Wildlife Service has added this native Montanan to the federal list of endangered species. The Catchall (Chris Hunter, Nov./Dec.).

GAME/HUNTING

Saturday Afternoon Fever—Retriever tests provide an opportunity for hunters to have the abilities of their dogs graded against written standards, without competition, under near-natural hunting conditions (story and photos by Dave Books, March/April).

Perspectives—"A Turkey Opera in Four Acts"—Gobbler Knob, deep in the Missouri Breaks, is the magnet that draws turkey hunters and turkey dogs alike (Tom Ellerhoff, illustrated by Chuck Herr, March/April).

Our Point of View—The well-being of ducks is everybody's business (K.L. Cool, March/April).

Look to the Future—Game bird habitat should prosper under an Upland Game Bird Habitat Program (Bob Martinka, May/June).

TIP-MONT Helps Put the Crunch on Poachers—Concerned citizens can help wardens protect the state's valuable wildlife resources (John Amoroso, July/August).

Harvest Ups and Downs—For hunting and harvesting some game species in Montana, the "good ol' days" are now (Terry Lonner, Bill Hoskins, and Candy Haskins, Sept./Oct.).

Bows, Arrows, and Bulls—Sportsmen continue to debate the pros and cons of archery and how it fits into Montana's elk hunting picture (Tom Lemke, Sept./Oct.).

Two Worlds of the Whitetail—Montana whitetails occupy two different worlds—one on each side of the Continental Divide (Gary Dusek, Nov./Dec.).

Perspectives—"Up the Creek and Over the Mountain"—Hunting should be for those who don't need to prove anything to anybody (Bernie Kuntz, Nov./Dec.).

Bulls on the TRMR—The Theodore Roosevelt Memorial Ranch is an important big game wintering area (Gary Olson, Nov./Dec.).

Poachers Feel the Sting of the Law—In recent months, the department has had great success in curtailing serious poaching activities (William Phippen, Nov./Dec.).

GENERAL

Special Photo Issue—(Jan./Feb.).

Thornbrugh Wins It Again—Victor artist Joe Thornbrugh won Montana's first waterfowl stamp contest in 1986—and he's done it again in 1990 (William Phippen, March/April).

New Wildlife Administrator—Don Childress—Don Childress, a 17-year veteran of the Department of Fish,

Wildlife & Parks, has been named head of the agency's Wildlife Division. The Catchall (March/April).

Conservancy Launches Watersheds Effort—The Montana Nature Conservancy is launching a program to protect the biological integrity of Montana's key rivers, streams, and streamside corridors. The Catchall (March/April).

Museum Showcases Chatham Art—The Museum of the Rockies will sponsor a retrospective of 30 years of work by Livingston artist Russell Chatham (Kay Morton Ellerhoff, May/June).

Perspectives—"High Plains"—The high plains is measured not in acres, but in miles (Marion Gebhart, May/June).

Perspectives—"The Return"—An annual trek isn't complete until the hikers hear the loons calling (Dellora Gauger, July/August).

Great Day in the Morning—The tales most often repeated in front of a winter's fire are those that happened before noon (Gary Turbak, photo by Dave Books, Sept./Oct.).

Our Point of View—Hunters, anglers, and park users support the management of Montana's fish, wildlife, and parks (K.L. Cool, Sept./Oct.).

A *WILD* Kind of Education—Project WILD is a unique environmental and conservation education program emphasizing wildlife. The Catchall (Deborah Richau, Sept./Oct.).

Look-Alike Signs—Standardized signs will make understanding road restrictions easier. The Catchall (Jim Cross, Sept./Oct.).

***T. Rex* Rises Again**—A 65-million-year-old pile of bones from the Fort Peck badlands has taken up residence in Bozeman's Museum of the Rockies (Kay Morton Ellerhoff, Nov./Dec.).

Nongame Sampler—"Quill Pig"—The porcupine's most distinctive characteristic is its defensive armor (Tom Butts, Nov./Dec.).

Watchable Wildlife: Expanding the Conservation Tradition—All across the country, state fish and wildlife agencies, federal land managers, and conservation groups are recognizing the importance of "watchable wildlife" (Deborah Richie, Nov./Dec.).

Our Point of View—As *Montana Outdoors* celebrates 20 years of publication, we are reminded that the issues of 20 years ago are still our business today (K.L. Cool, Nov./Dec.).

Major Moves—Promotions and retirements change the administrative make-up of Fish, Wildlife & Parks. The Catchall (Nov./Dec.).

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Bob Watts: Always the Biologist—A tribute to a dedicated and concerned wildlife professional who died recently. The Catchall (Gary Olson, Nov./Dec.).

PARKS/DEPARTMENT LANDS

Musings of a Tour Guide—A tour guide takes you through room after spellbinding room in the Lewis and Clark Caverns (Leslie Rickey DeVos, May/June).

Our Point of View—Exciting and encouraging things are happening as the Governor's State Park Futures Committee's work gains momentum (K.L. Cool, May/June).

Champion Donates Choice Wildlife Land—Champion International Corporation donated some of the finest lake and forest recreation land in the country to the people of Montana (Tucker Hill and Mike Aderhold, Sept./Oct.).

Giant Springs: The Big Bubbly—Giant Springs Heritage State Park attracts some 250,000 visitors each year (Harley Yeager, Sept./Oct.).

WILDLIFE

Identification of Montana's Owls—A guide to help you distinguish between the 15 owl species that live in Montana, along with some facts about their life history (Denver W. Holt and Dale M. Becker, illustrated by Joe Thornbrugh, March/April).

A Gathering at Hauser—After the number of eagles migrating through Glacier National Park declined, Montana's eagle watchers were looking for a new hot spot—Hauser Lake near Helena filled the bill (Deborah Richie, illustrated by Don Jensen, March/April).

Nongame Sampler—"Alpine Whistler"—If you hear a humanlike whistle when you're in Montana's high country and no other humans are around, you could be in the company of a hoary marmot (Dr. Philip L. Wright, March/April).

There's Something Wild on Your Tax Form—Line 49 on your income tax form provides a chance to support one of Montana's greatest assets: its internationally famous wildlife heritage. The Catchall (March/April).

Developments at Dancing Prairie—Two sections of land near Eureka contain the only surviving dancing ground for the Columbian sharp-tailed grouse in Montana (Mike Aderhold, May/June).

Census by Camera (More Than Just Another Pretty Face)—A camera system using infrared heat sensors enables researchers to count bears—and other visitors—more accurately (Tom Palmer, May/June).

Nongame Sampler—"Red-Necked Mystery Bird"—Not much is known about this colorful and distinctive Montana visitor, the red-necked grebe (Dennis Flath, May/June).

Nongame Sampler—"Brains of the Bird World"—Crows and ravens turn "bird-brained" into a compliment (Deborah Richie, July/August).

Old Values, New Times—Block management is a tool for managing people and wildlife (Mike Korn, July/August).

Ducks and Skunks: Waterfowl and Predation—A western Montana predator control study shows great promise for improving duck nesting success (Carol Susan Woodruff, photos by Dave Books, July/August).

Nongame Sampler—"The Coeur d'Alene Salamander: Montana's Cliff-Hanger—This four-inch lungless amphibian calls a steep rock face near Libby home (Dave Genter, Sept./Oct.).

Seekers of Snags—Seventy-two species of wild animals in Montana use or depend on snags for nesting, feeding, shelter, or perching (Deborah Richie and Susan Reel, Sept./Oct.).

New Guide Lists Wildlife Viewing Hot Spots—A new book helps direct Montanans and visitors interested in seeing wildlife. The Catchall (Deborah Richie, Sept./Oct.).

Mitigation in the Flathead

by John Fraley

Photo by Diane Ensign

A CYNIC ONCE LIKENED MITIGATION to fitting a man with a wooden leg after he lost a limb in an accident. Webster defines mitigation: making less severe, alleviating, mollifying. Many biologists and managers use the term loosely to refer to compensation, protection, or an attempt to repair damage done to the environment by dams or other social works such as land development. Perhaps the concept is hard to define because technology is evolving and few managers report large-scale success in mitigating environmental damage.

In the Flathead system of northwestern Montana, government agencies are moving forward with a small but important part of the largest fish and wildlife mitigation effort in the history of the Pacific Northwest. The Northwest Power Planning and Conservation Act of 1980, or Northwest Power Act, directed governments in the Pacific Northwest (Oregon, Washington, Idaho, and Montana) to balance use of the Columbia River system for power production with fish and wildlife. The act created an eight-member Northwest Power Planning Council and directed that body to plan fish and wildlife mitigation, protection, and enhancement and to produce a long-term power production and conservation plan. The act directed the Bonneville Power Administration (BPA) to fund the fish and wildlife restoration effort. Mitigation efforts for fisheries losses attributable to Hungry Horse, Kerr, and Bigfork dams form an integral part of the Northwest Power Planning Council's Fish and Wildlife Program.

For Hungry Horse and Kerr dams, decisions will likely be made within the next year on scope of the mitigation effort, funding levels, and mitigation methods. Soon after, managers will begin the fisheries mitigation and enhancement efforts. These efforts culminate eight years of study, planning, and discussion.

THE PROBLEM

The problem associated with fisheries mitigation in the Flathead system could be divided into three parts. First, the fisheries losses caused by dam operations are substantial and should be mitigated. Second, the cost of mitigation will be significant and most will be borne by the electric rate payers in the Pacific Northwest. Third, the success of many mitigation measures is uncertain because little precedent exists for efforts on this scale and because biological conditions are changing in the system.

Construction and operation of Hungry Horse, Kerr, and Bigfork dams caused fisheries losses in the system; these losses are clear, but the degree and causes of some are arguable. When the Bureau of Reclamation completed Hungry Horse Dam in 1953, the 540-foot concrete structure blocked all fish migrations into the South Fork of the Flathead system. The Department of Fish, Wildlife & Parks conservatively estimated potential losses to Flathead Lake at approximately 65,000 migratory westslope cutthroat and 2,000 large

adult bull trout (equivalent to 250,000 young bull trout) per year. Operation of the project caused large fluctuations in water levels in the rivers downstream, stranding spawning beds of kokanee and affecting rearing of bull trout, cutthroat trout, mountain whitefish, and aquatic insects. Losses in the kokanee population slowed the growth of lake trout, a species which relies on kokanee for forage in Flathead Lake.

The dam also has affected water temperatures. Discharges at the dam originate from the deep, cold waters near the reservoir bottom; these discharges chill temperatures in the river downstream. Cold, unnatural temperatures during summer and early fall slow trout growth and disrupt life cycles of aquatic insects.

Hungry Horse Reservoir is plagued by fluctuating water levels and deep drawdowns. These drawdowns expose the reservoir bottom, eliminate fish food organisms, and reduce fish growth and survival. Bull trout and cutthroat trout from the reservoir migrate into the upper South Fork of the Flathead River, so losses in the reservoir affect the popular fishery in the Bob Marshall Wilderness.

Many argue that Hungry Horse Dam provides some benefits to natural resources. During drought years (for example, 1988), water stored in the reservoir can improve flows in the Flathead River. In winter, releases of water from the reservoir can prevent heavy ice build-up common before construction of the dam. And, although the dam flooded the free-flowing South Fork of the Flathead River and its tributaries, the reservoir created by the dam supports a fishery that partly offsets loss of the stream fishery.

Kerr Dam blocked fish migration from the lower Flathead and Clark Fork rivers. Also, operation of Kerr affected nearly 6,000 acres of aquatic habitat near the shore of Flathead Lake and the upper Flathead River important for spawning and rearing fish. In the Flathead River below Flathead Lake, water levels have fluctuated with demands for power production. Over 2,400 acres of habitat were affected. Consequently, river fisheries—including brown trout, rainbow trout, and pike, and the organisms on which they feed—have suffered.

Bigfork Dam blocked historic runs of westslope cutthroat and bull trout in the Swan system. No estimates are available for losses of these species.

The unique fisheries resources in the Flathead system are valuable to the area's economy and quality of life. But, another factor considered important to the area's quality of life is low-cost and reliable electric power. Costs for mitigating fisheries losses associated with Kerr, Hungry Horse, and Bigfork dams in the Flathead Basin could reach as high as $1.5 million annually. In addition, changes in operations of the facilities could mean additional costs to replace lost generation. Many consider

Westslope Cutthroat Trout

these legitimate costs of doing business; many consider the price too high. Compared with the cost of mitigation in the rest of the Columbia River (more than $50 million), funds recommended for Montana seem relatively low. Also, dollars spent on projects in Montana will have multiplying effects in the area's economy. Hungry Horse Reservoir provides almost one-fifth of the water storage in the United States in the entire Columbia system. Many point out that a portion of the revenue derived from this water storage should be reinvested each year in the resource.

Some mitigation steps proposed for fisheries in the Flathead system are untried on a large scale. Also, biological conditions in the lake and river system are not static, particularly with the establishment and fluctuations in the *Mysis* or opossum shrimp population. Because of these uncertainties, the mitigation process will require a long-term commitment and may not achieve the immediate results desired by many. Adaptive management—a trial and evaluation approach—will be required to determine which remedies are most effective. Using this approach, agencies can continually evaluate and improve benefits from the mitigation program.

THE PLAYERS

Fisheries mitigation has become one of the most controversial natural resource issues in the Flathead system, partly because of the large number and diversity of involved groups.

The Department of Fish, Wildlife & Parks, Confederated Salish and Kootenai Tribes (Tribes), and U.S. Fish and Wildlife Service all have fish and wildlife management authority in the basin. The department and Tribes manage fisheries in the system based on a co-management plan for Flathead Lake and River, and are the responsible parties for implementing mitigation steps. The U.S. Fish and Wildlife Service provides fish production through the Creston National Fish Hatchery. The Columbia Basin Fish and Wildlife Authority represents all fish and wildlife interests in the Columbia system and assists agencies in planning and coordinating mitigation efforts.

The Northwest Power Planning Council advises the BPA on types and levels of fish and wildlife mitigation for federal projects, such as Hungry Horse. The Federal Energy Regulatory Commission directs licensing and mitigation at private projects such as Kerr Dam.

The Bureau of Reclamation operates Hungry Horse Dam and cooperates in mitigation activities, but has no respon-

MIKE ADERHOLD

DIANE ENSIGN

Operation of Kerr Dam (above left) on Flathead Lake affected thousands of acres of aquatic habitat near the shore of the lake and the upper Flathead River important for spawning and rearing fish. Mitigation efforts for this and other area dams are helping to preserve valuable fisheries in the Flathead system.

sibility for funding mitigation under the Northwest Power Act. The U.S. Army Corps of Engineers directs flood control operations. The Montana Power Company (in co-license with the Tribes) operates Kerr Dam, and carries fish and wildlife mitigation responsibility under articles of the operating license. Pacific Power & Light Company operates Bigfork Dam and cooperates with fish and wildlife agencies under their operating license. Virtually all project operators in the Columbia system coordinate dam operations for power generation under the Pacific Northwest Coordination Agreement. Project operators are concerned with efficient operation of the projects for electrical power generation, flood control, recreation, fish and wildlife, and other uses.

The BPA markets power from federal dams in the Columbia drainage and bears funding responsibility for fish and wildlife mitigation at these projects, including Hungry Horse. Mitigation and other BPA expenses are funded by electric rate payers. Private utilities produce their own power, but also buy power from BPA. Rural Electric Cooperatives buy power from BPA and utilities and distribute it to their customers. Direct service industries, such as the Columbia Falls Aluminum Company, are major users of electricity from federal projects. The Pacific Northwest Utilities Conference Committee represents these three major customer groups of BPA. In general, utilities and rate payer representatives are concerned with carrying out the provision of the Northwest Power Act in the most cost-effective manner. In attempting to maintain low electric rates, they consider the cost of fish and wildlife mitigation an important issue.

Many groups participating in the mitigation process represent users or conservers of fish and wildlife resources and habitat in the Flathead Basin. The Flathead Basin Commission has no regulatory authority, but represents water quality interest in the Flathead and strongly supports public involvement in mitigation issues. The Flathead Lakers are most interested in water quality and consider native fish and their habitat indicators of water quality. Trout Unlimited places high priority on native fish species and quality aquatic habitat. The Flathead Fishing Association and the Montana Charter Boat Association place priority on the trophy lake trout fishery in Flathead Lake and increasing production from fish hatcheries. Audubon, Flathead Wildlife, Inc., and the Flathead Lake Protection Association are concerned with quality aquatic habitat and resource economics.

THE REMEDIES

The department, Tribes, and utilities have proposed remedies for fish and wildlife losses attributed to Hungry Horse, Kerr, and Bigfork dams. Taken together, these programs form an integrated approach to enhancing fisheries damaged by hydropower development.

Fisheries mitigation steps for Hungry Horse losses include: (1) non-operational remedies, or those not requiring dam operation changes, and (2) operational remedies, or those requiring change in the timing and volume of water released from the dam.

Non-operational remedies include:

- **Habitat enhancement:** Stream, reservoir or lake habitat could be improved by adding instream fish cover, removing silt, fencing stream sides, and adding spawning gravel.
- **Fish passage improvements:** Streams blocked to fish migration could be reopened by improving culvert design or installing fish ladders.
- **Hatchery production and fish planting:** The capacity of Creston National Fish Hatchery, the Somers State Hatchery, or other hatcheries to produce fish eggs and fry for imprint planting (plants designed to create new spawning runs or enhance existing runs) could be upgraded and direct plants of larger fish could be implemented.
- **Off-site habitat improvement and/or planting of hatchery fish:** Fisheries in waters outside Flathead Lake and River system could be improved to provide more fishing opportunity.

The total estimated cost for non-operational remedies is approximately $525,000 per year, and a total of $3.5 million in one-time capital costs.

Operational remedies could cost something, and FW&P is working with BPA to estimate costs for some of the options. Operational remedies include:

- **Drawdown limits:** Deep drawdowns reduce fish food production and increase fish predation.
- **Reservoir refill timing:** Failure to refill during July or late refill in the spring compromises fish growth and access to spawning tributaries.
- **Timing of reservoir drafting:** Early drawdown in the late summer or fall affects fish food production and trout growth.
- **Minimum flows in the Flathead River at Columbia Falls:** Minimum stream flows provide needed habitat for young trout and fish food organisms.
- **Control of high river discharges:** Large daily discharges of cold water from Hungry Horse affect trout growth and aquatic ecology and have resulted in river channel erosion. Discharges could be ameliorated through a change in operations of Hungry Horse Dam or by construction of a re-regulating reservoir on the South Fork below the dam.
- **Selective withdrawal:** Retrofitting Hungry Horse Dam to withdraw water from different depths in the reservoir would return water temperatures to near natural levels in the South Fork and in the main stem Flathead River. Selective withdrawal may or may not affect operations.

Remedies proposed for mitigation of Kerr losses are similar and integrated with the Hungry Horse program. The Montana Power Company's plan before the Federal Energy Regulatory Commission calls for minimum flow and other limited flow changes in the Flathead River below Kerr Dam, hatchery production for the lower river and Flathead Lake, and habitat improvement work in both areas. To produce hatchery fish, the plan calls for improvements at Creston National Fish Hatchery, construction of a small-scale Tribal hatchery to serve the Flathead River below Kerr Dam, and annual operating funds. The total cost proposed for fisheries in the Kerr Plan is $2 million in one-time capital costs and $775,000 annually for the period of the license.

Pacific Power & Light Company has completed design of the fish ladder at Bigfork Dam. Cost of the fish ladder and screens to protect fish moving downstream will total approximately $700,000. Once the ladder is constructed, Pacific Power & Light and the department plan several years of trap monitoring to determine its effectiveness. If lake trout and lake whitefish are found to ascend the ladder, measures will be required to control introduction of these species to the Swan system.

THE PROCESS

The department and Tribes are negotiating fisheries mitigation for Kerr, Hungry Horse, and Bigfork dams through separately mandated legal channels, but,the processes are closely coordinated. First, all are included in the Northwest Power Planning Council's Fish and Wildlife Program. Second, timing of the efforts is coordinated so that mitigation should be under way at all three projects in the next year. Third, the Flathead system co-management plan outlines fisheries management direction for the mitigation program. Fourth, the same group of citizens and utility, fisheries, and wildlife groups will advise the state and Tribes during implementation. Finally, all dam operation changes could be considered together in the context of the Columbia System Operation Review, a three to four-year Environmental Assessment headed by the BPA, Bureau of Reclamation, and Corps of Engineers.

Bull Trout

Fish and wildlife mitigation specifically for Kerr Dam is proceeding through a re-licensing process. Montana Power Company and the Tribes were granted an operating license for the 1985-2035 period; the Tribes have the option to take sole control of the project in 2015. As part of the license, Montana Power consulted with resource agencies in the basin to develop a mitigation plan and submitted the plan in July 1990 to the Federal Energy Regulatory Commission with the approval of the Tribes, FW&P, and the U.S. Fish and Wildlife Service. A public comment period closed November 13.

Since January, the department and the Tribes have conducted a scoping and consultation process to discuss issues and guide planning on fisheries mitigation for Hungry Horse Dam. The department and Tribes are scheduled to present the mitigation plan to the Northwest Power Planning Council in early winter. The council will conduct its own public comment process, then make its recommendation in spring or summer of 1991.

THE CONTROVERSY

Much of the controversy surrounding fisheries mitigation in the Flathead system centers on three issues: (1) operation of dams for fisheries, power, or downstream uses; (2) natural fish production versus hatchery production, and (3) the economics of such a large-scale repair effort. The more than two dozen members of a consultation group representing the major players are wrestling with these issues.

Dennis Christensen is project superintendent for the Bureau of Reclamation at Hungry Horse. "As operator of the project and a federal employee, I'm supposed to follow the will of the

MIKE ADERHOLD

JOHN FRALEY

Hungry Horse Reservoir (above) is plagued by fluctuating water levels and deep drawdowns; the dam causes large fluctuations in water levels in the rivers downstream (above right), stranding spawning beds and affecting rearing of bull trout, cutthroat trout, and mountain whitefish.

people," says Christensen. "When the dams were built, people placed high priority on power and flood control. Environmental issues have now become very important. I'm in an uncomfortable position trying to balance those needs efficiently."

Ron Wilkerson of the Western Montana Electric Generating and Transmission Cooperative, Inc., is concerned with maintaining a low-cost, reliable power system. Says Wilkerson: "What we want out of these mitigation processes is maximum benefit to all uses of the system; power is one of the major uses and these upstream dams are tremendously important to the power system. We will be sensitive to mitigation options which do not return good benefits for dollars spent. Also, biological damages attributed to the dams must be well documented."

Dave Minister of the Montana Charter Boat Association is concerned with impacts of Hungry Horse and Kerr dams on spawning kokanee and the subsequent decline of the trophy lake trout fishery and effects on the area's economy. "In the 1970s, I recall fishing for kokanee in the Flathead River one evening, then returning the next morning to find our fishing area high and dry," said Minister. "I kicked around the area and found hundreds of dry salmon nests. That evening the area was wet again, and kokanee were in there spawning in an area where their eggs were doomed to 100% mortality. It boggles the mind to think of the number of eggs destroyed every day all the way down the river. Also, Kerr Dam stranded eggs in the bays of Flathead Lake. All of this happened long before *Mysis* shrimp became established in Flathead Lake. I view Flathead Lake as a severely damaged natural treasure. Let's use this opportunity to mitigate the losses caused by these dams."

"Water quality is our most important concern," says Elna Darrow of the Flathead Lakers. "We oppose use of hatcheries for mitigation unless there is no workable alternative. We would rather see the use of mitigation funds to improve the water quality (for example, temperatures below Hungry Horse) and habitat quality, to increase fish populations naturally. We are concerned that operational problems at Hungry Horse and Kerr dams be solved together."

"The U.S. Fish and Wildlife Service has offered the use of the Creston National Fish Hatchery in these mitigation efforts," says Larry Lockard of the U.S. Fish and Wildlife Service. "We recommend that efforts move forward on mitigating the agreed-upon losses with things like habitat improvement and hatchery production. Operational issues could take several years to resolve through the upcoming system operation review and should not delay steps that could be taken now."

Ken Kettinger is president of the Flathead Fishing Association which represents over 400 local anglers. Says Kettinger: "The lake trout fishery has declined each year, from an average size of 11 pounds to nine pounds to seven pounds. Other fish have been impacted too. When you consider the value of one angler day being more than $50, this decline is going to mean serious losses to our local economy. We can't bring back the fishery naturally when we've lost half of our spawning grounds to dams. Sure, we need improved flows for fish. But, we need to rebuild the fishery with hatcheries. I'm not talking about one small hatchery; I'm talking about an aggressive hatchery program."

Don Alley and Ric Smith of Trout Unlimited developed a mitigation policy accepted by the state council of that group. The policy states: "Trout Unlimited supports maintaining the wild character of the Flathead fishery. Trout Unlimited supports flow regime coordination between Hungry Horse and Kerr that reflect fishery values, as well as power generation values. Hatchery supplementation is opposed by Trout Unlimited." The policy also outlines support for natural habitat improvement and projects to create new natural spawning and rearing areas.

Whatever the shape of the final mitigation package for the Flathead system, clearly not everyone will be satisfied.

continued on page 37

HARRY ENGELS

QUILL PIG

by Tom Butts

I remember it as one of those radiant Indian summer days when the sky is clear and deep, the air crisp, the leaves on the aspens and cottonwoods a shimmering chrome yellow—a day you'd like to carry in your pocket like a well-used jackknife, to bring out and savor when you needed to. I was hunting whitetails along Flatwillow Creek in central Montana, deep in the crimson willows that grew abundantly along the creek and provided excellent cover for both deer and pheasants. No wonder I was startled to hear a baby crying loudly nearby.

I suppose finding a human baby wailing away in a willow patch seemed just about as unlikely to me that marvelous autumn day as seeing a polar bear crossing the creek. Naturally, I investigated. I discovered the crying came from a deep hole just above the water. I peered in cautiously and came face to face with the wailer himself. Instead of a misplaced infant, I found a miffed male porcupine. He greeted me with a grunt and retreated deeper into the hole.

Porcupines (*Erethizon dorsatum*) are Montana's second largest rodent (the beaver is larger). A really big one can weigh 30 pounds. They're found throughout the state, and although they are usually found around trees—which they are quite fond of eating and occasionally killing—I've been surprised to find them far out on the prairie near extensive grasslands and in sagebrush basins. However, they are generally not too far from some kind of woody cover. They also eat grasses and forbs, especially during the summer. But porkies are particularly fond of everything that has to do with trees and shrubs; they love the leaves and buds, and they thrive on the cambium just under the bark. In fact, they often girdle trees by chewing off the bark and cambium all the way around, killing the tree. When you're in the woods and see a number of trees girdled high above the ground, you know you have found a favorite quill pig spot.

Probably the most distinctive characteristic of the porcupine is its impressive defensive armor. The quills are actually modified hairs with spongy interiors and sharply pointed, black-tipped ends. They cover the animal from its nose to the tip of its tail, except on the underside, and are longest on its shoulders and thickest on the tail.

The porcupine has long hairs, called guard hairs, as well as quills. These hairs are off-white or yellow, with brown or black tips. Young porcupines usually are very dark colored, but adults have a yellowish or golden cast because of these long guard hairs. I once found an albino porcupine, but these are rare.

When alarmed, the porcupine turns its rear toward the potential attacker and raises its quills to defend itself. It can use its tail to hit an attacker, but it cannot throw quills as is sometimes thought. Even very young porkies display this defensive posture. Several years ago, I saw two young porcupines about the size of small grapefruits, and they erected their tiny quills and did their best to keep their backs to me as I looked at them. And yes, the less than inch-long quills were plenty sharp.

The end of a quill has overlapping, almost shinglelike, barbs that point away from the tip. They are thus very difficult to pull out once they have penetrated the skin, as anyone knows who has had to remove them from the mouth or face of a favorite dog. If they are not removed, muscle contractions will actually pull the quills deeper into the flesh. There are a number of documented cases of domestic and wild animals dying from porcupine encounters.

Regardless of its formidable defenses, when they are hungry enough, a number of predators—including mountain lions, coyotes, foxes, and wolverines—attempt to dine on porcupine. Fishers in particular are fond of porky fare. These predators try to flip the porcupine over and attack its vulnerable unprotected belly.

Porcupines are generally solitary animals. They feed primarily at night, although it is not unusual for them to be out and about during daylight. They don't hibernate during the winter; at times, especially during severe weather, they den in holes under rocks or in trees, sometimes with several den mates.

Breeding occurs during fall and several males may associate

L. PAUL JONES

Porcupines are particularly fond of trees and shrubs, although they also eat grasses and forbs.

with one female. Porcupines are probably most vocal during this time, emitting the high-pitched screams sometimes mistaken for wild cats or a baby's cry. In case you're curious, they mate with the male mounting from the rear. Gestation is remarkably long for a rodent, as most rodents give birth within a few weeks after mating. The porcupine takes its time, averaging seven months (about the same time as a deer). In late April or early May, the female gives birth; her one offspring is born with open eyes and operational quills. The young grow rapidly and are almost adult size by autumn.

The life span of a wild porcupine is about seven years, although they have lived more than 10 years in captivity.

Porcupines are considered pests throughout their range, and the prevalent attitude seems to be: "The only good porcupine is a dead porcupine." They can damage and sometimes kill trees, and they love to gnaw on and ruin equipment that holds the salt from human sweat, such as ax handles or canoe paddles. Owners of dogs and horses in porcupine territory cultivate an instant animosity when they have to remove quills from their pets.

Despite years of trapping, shooting, poisoning, and other attempts at control, porcupine populations are still holding their own throughout their range. In areas with extensive commercial timber, the fisher, a large relative of the mink, has been introduced to control porcupine populations with some success. Mechanical barriers such as fencing or metal skirting are useful in small areas such as orchards, and some wood preservatives act as a repellent when applied to exterior plywoods.

For most of us, porcupines will rarely be a problem. Instead of wantonly killing them, it seems to me we should learn to live with them by changing our own habits wherever possible. We can keep our pets restrained, and we can put away our tools. Woodsmen once felt it was a crime to kill a porcupine because it might one day provide the only food source for someone lost in the woods. Perhaps we should adopt a similar attitude today. Who knows when a fellow creature in some way may become a lifesaver?■

Poachers Feel The Sting Of The Law

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As a result, Kent said, the department's present philosophy is to "really go after those individuals who commit the more serious, deliberate violations."

Aiding in the cause has been an undercover or "covert" unit of game wardens which, over the past few years, has contributed to some of the most significant cases against game law violators in Montana.

"Our covert operations have proved very worthwhile," said FW&P's Cool, "and we intend to strengthen that area as we head into the '90s. We feel it will be a strong deterrent to those who would use our wildlife resources for their personal gain."

Sportsmen, landowners, and the general public will remain the department's number one tool in reducing the illegal taking of wildlife from the Montana landscape. Through programs like the TIP-Mont hotline, which is receiving growing use year after year, "sportsmen are telling us that they want the quality of our wildlife resources maintained," Cool said.

"Montana is home to some of the finest wildlife and fisheries populations in the world," Cool explained, "and it is incumbent on all of us to do our best to protect and manage them."■

ALAN NELSON

EXPANDING the Conservation Tradition

by Deborah Richie

MAGPIES CHATTER AND SQUAWK in the old cottonwood tree outside the turn-of-the-century ranch house. An elusive fox dwells among the willows, chokecherry, and aspen by the irrigation pond. In the evenings, Dwight and I wander the prairie hillsides watching antelope race across the grasses as if striding on air. Like many Montanans, we treasure the wildlife close to home. We keep a log of our nature sightings and a reference shelf of field guides to answer our many questions.

All across the country, state fish and wildlife agencies, federal land managers, and conservation groups are recognizing the significance of "watchable wildlife." This term embraces both viewing and appreciation of wildlife and fish in their native environments. Nongame programs particularly can benefit from the growing popularity of watchable wildlife. Montana's Watchable Wildlife Program began this year, as part of Department of Fish, Wildlife & Parks' information efforts for nongame. However, the program also meets a rapidly increasing public demand for viewing all wildlife and fish species.

A 1985 U.S. Fish and Wildlife Service study found that participation in observing, photographing wildlife, or feeding birds increased nearly 50% from 1980 to 1985, from 93 million to 135 million Americans.

K.L. Cool, director of the Montana Department of Fish, Wildlife & Parks, recently hailed Montana's Watchable Wildlife Program as a key part of the department's efforts. At the Gates of the Mountains wildlife viewing site on the Missouri River, he predicted Montana will become the "watchable wildlife capital of the country."

That's no idle boast. Montana possesses the clean air, water, food, and shelter needed for more than 600 species of wildlife and fish. We still have places wild enough for the grizzly bear and the eagle.

Montanans expect to see red-tailed hawks in the winds as they drive along the highways. They expect to see white-tailed deer and great blue herons along rivers. They look for trout swimming in clear lakes. The opportunity to watch wildlife and fish is integral to the high quality of life in this state.

IN FACT, 90% OF MONTANANS ENGAGE IN WATCHABLE WILDLIFE ACTIVITIES, topping the national average of 74% of Americans. Montana's Watchable Wildlife Program helps point out where, when, and how to view, including encouraging observers to give animals and birds the room they need to live. That means observing from a respectful distance and using binoculars or a telephoto camera lens to bring wildlife closer.

Often, residents want to become involved with wildlife habitat programs as well as to watch wildlife and fish. For example, a news column last spring on the return of the bluebird generated a stream of requests for bluebird nest box blueprints. People from Cut Bank, Reserve, Chinook, Richland, Forest Grove, Westby, and Babb—to name a few places—requested the plans (blueprints are still available from FW&P offices).

Providing hands-on activities to enhance wildlife and fish habitats forms another facet of watchable wildlife programs in many states. For example,

Wyoming's "Worth the Watching" program offers backyard habitat kits containing seeds of plants beneficial to wildlife, guides for landscaping, and instructions for building birdhouses and feeders.

Montana's Watchable Wildlife Program is like an umbrella—it covers not only fish and wildlife programs, but also nongame efforts. The concept can be used especially effectively to heighten awareness of the needs of many species not hunted, trapped, or fished. For example, by first drawing people's attention to a glamorous species like a mountain goat on a cliff, it is then easy to interest them in other alpine wildlife, like marmots, pikas, and ravens.

Montana's nongame program gathers up loose ends—songbirds, hawks, eagles, owls, herons, chipmunks, rabbits, badgers, prairie dogs, foxes, turtles, snakes, lizards, bats, and more—and clumps this 85% of all Montana's wildlife and fish species together under one word: nongame. They are species that cannot be neatly labeled as game, furbearers, predators, or threatened and endangered.

The Nongame Wildlife Program is funded by a combination of revenues from the income tax check-off, hunting and fishing license dollars, and some federal funding. The 1990-91 total is about $90,000, including salaries for the nongame coordinator and information specialist. Tax check-off revenues have steadily declined, from an initial high of $34,000 in the first year (1984) to about $21,000 last year. The program is tiny, but its needs are great.

When I started working as the nongame information specialist a year ago, the tasks ahead appeared formidable. Unless I was speaking to people who already knew a lot about the nongame program, I soon learned to expect blank stares or hesitant questions when I told people about my job. What could be done to reverse this trend of declining contributions to the nongame check-off on the state income tax form?

A year later, I believe a partial solution to helping publicize the state's nongame program lies in departing from the nondescript term "nongame," and instead adopting "watchable wildlife," a term that suggests the positive action of observing wildlife and fish, something we all enjoy doing.

Wildlife watching in itself is nothing new. Daydreaming out the window idly, you may see a downy woodpecker chipping away at bark. You marvel a bit at the industry of this little bird pounding its beak against a tree. Then you return to work.

A successful watchable wildlife program should stimulate people's curiosity beyond simple observation. For instance, providing natural history information on woodpeckers falls under the watchable wildlife umbrella. Encouraging appreciation for nature's complexity is an essential component.

Social changes sweeping our country are affecting the way people relate to their wildlife heritage. More people are moving to cities. Fewer spend time hunting. Where traditionally fathers passed on the skills of hunting and wildlife appreciation to their children, increasingly more children are growing up in single-parent families or in urban settings where they learn about wildlife in other ways. Montana's Watchable Wildlife Program provides an avenue for people to stay in touch with the land, its wildlife, and fish, and to better understand the need to maintain habitat.

Watchable wildlife improvements are gearing up in Montana through the pooled efforts of agencies, nonprofit groups, and businesses. Already, these efforts are demonstrating that watchable wildlife qualifies for funding from a variety of sources because of the key role it can play in diversifying the state's economy.

Wildlife viewing brings in at least $44 million annually to the state, according to the 1985 U.S. Fish and Wildlife Service study. That figure ought to rise with added efforts to emphasize viewing opportunities outside national parks.

The 1990 "Montana Wildlife Viewing Guide" has done more to spark interest in watchable wildlife than any

DEBORAH RICHIE

DEBORAH RICHIE

Governor Stan Stephens (above left) dedicated a wildlife viewing site at Gates of the Mountains near Helena in August, and Missoula artist Monte Dolack (above right) recently created a poster to promote Montana's Watchable Wildlife Program.

MONTANA'S WATCHABLE WILDLIFE

Support Montana's Watchable Wildlife

Savor the beauty of Montana's watchable wildlife through a poster created by Monte Dolack. Dolack is known best for posters and fine art that have won him awards in national exhibits. He is also dedicated to wildlife and fish conservation.

The loons on a wild lake in the Swan Valley portray one of more than 600 species of wildlife and fish in Montana that will benefit from the sale of this poster.

Montana's watchable wildlife is a new program of the Montana Department of Fish, Wildlife & Parks. Its goal is to help people appreciate and conserve all fish and wildlife species and their habitats.

Proceeds from poster sales will go into a watchable wildlife fund to be used for education and interpretation of our wildlife and fish heritage.

For faster service, call toll-free at 1-800-582-2665

Qty.	Description	Price Per Copy	Total
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Montana's Watchable Wildlife, P.O. Box 1718, Helena, MT 59624

single effort. When the guide first hit the bookstores in June, every major newspaper ran feature stories on wildlife viewing. When Governor Stan Stephens dedicated a viewing site at the Gates of the Mountains in August, both newspapers and television touted the arrival of new economic opportunity for Montana's communities via watchable wildlife.

FW&P joined more than 10 other cooperators in helping to fund, research, and produce the guide to 113 wildlife and fish sites around the state. "Wildlife Viewing Area" signs and a binocular logo mark each site. Eighty-nine lie outside the popular wildlife viewing destinations of Yellowstone and Glacier National parks. FW&P manages about one-third of the sites.

Since viewing wildlife is the No. 1 reason people travel to Yellowstone National Park, according to a recent survey, then it makes sense that those thousands of visitors would also be interested in seeing wildlife in places outside the park, and spending their vacation dollars there as well.

The viewing sites also serve as stellar destinations for environmental education. When people see an osprey plunge for a fish and then learn that the same bird flies as far as central America each winter, they better appreciate that piece of knowledge than if they gleaned it from a book without firsthand experience.

Adding interpretive signs, brochures, or nature trails at the viewing sites will follow as funds become available. Places to view and interpret wildlife exist throughout the department's network of 60 state parks and 62 wildlife management areas as well.

TO BUILD A SUCCESSFUL WATCHABLE WILDLIFE PROGRAM requires spreading the word inside and outside Montana's borders, including reminders in people's living rooms and on their office walls.

A logo identifies Montana's watchable wildlife. It appears on signs, brochures, and exhibits as a trademark of efforts by the Fish, Wildlife & Parks department. This year's state income tax form will carry the logo's bald eagle next to the nongame wildlife check-off box to draw attention to its importance.

Two Montana artists are putting their creative talents toward Montana's Watchable Wildlife Program in separate fund raisers.

Sculptor Bill Ohrmann of Drummond is working on a watchable wildlife series of bronzes. Ohrmann, an ardent supporter of the nongame program, donated the bronze series as a fund raiser for Montana's watchable wildlife. His first bronze of a fox and kits is now for sale (see the article in this issue's "The Catchall" section).

Missoula artist Monte Dolack has just unveiled a poster commissioned by Montana's Watchable Wildlife Program. Dolack agreed to create the poster—of loons in the Swan Valley—because he supports efforts to learn about and care for creatures as mysterious as the loon. The poster illustrates one of the program's key messages: Wildlife and fish are linked to one another in a series of fragile connections, and to the land and water that surround them.

A model wildlife interpretive site, scheduled for completion by summer 1991, will demonstrate the possibilities for similar displays in other parts of Montana. This display, along the Yellowstone River six miles north of Gardiner, will show the significance of lands and waters beyond Yellowstone National Park's boundaries for wildlife and fish. The cooperative endeavor of FW&P, Gallatin National Forest, and the Rocky Mountain Elk Foundation also shows the kinds of alliances that can be formed in the name of watchable wildlife.

Traditionally, Fish, Wildlife & Parks has relied on hunter and angler support to build a strong conservation record that includes: the return of bighorn sheep to historic ranges; the establishment of wildlife management areas, including vital wetlands for waterfowl and elk winter ranges; and stewardship for native fish populations and their habitats.

Now, Montana's Watchable Wildlife Program presents a grand opportunity to expand the conservation tradition, thus developing even stronger support and conservation efforts for all wildlife and fish species.

Many Montanans choose to live here because they appreciate the wild fish in free-flowing rivers, the proximity of wilderness, and the knowledge that the land is rich in wildlife. Many visitors choose Montana because of vast wildlife and fish resources.

Watchable wildlife flows into a wave of change flooding the West. Westerners are recognizing that we are at a crossroads. We can strike a balance that allows for some growth while conserving what is becoming an international treasure: our wildlife and fish.■

A CHRISTMAS GIFT FOR WILDLIFE

When you purchase the "Montana Wildlife Viewing Guide" at any of the FW & P offices you are helping to support Montana's Watchable Wildlife. Proceeds from sales of the $5.95 guide go into a watchable wildlife fund.

Mitigation in the Flathead
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Some groups' positions on several issues are in direct conflict. And, not all the issues will be solved soon. Many feel that final decisions on dam operations must wait until the three or four-year Columbia system operation review is completed. Any changes made in the Flathead system affect water demands at Libby Dam and other dams in the Columbia system.

The choices are difficult and the answers complex. Randy Moy, of the Bonneville Power Administration, urged consensus among the diverse groups if possible. "Don't leave it to the Power Planning Council or BPA or others to resolve differences," he said. "If you do, it could take considerable time with no assurance of what the final mitigation package might look like."■